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[OFFICIAL NOTICE.]

The Fourteenth Annual Meeting of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
August 25, 1886.

To the Members of the Association:—The Fourteenth Annual Meeting of our Association will be held in the city of Philadelphia, Pa., on Wednesday, Thursday, and Friday, October 20th, 21st, and 22d. The headquarters of the Association will be at Hotel Lafayette, corner Broad and Chestnut streets, about three minutes' walk from the Pennsylvania Railroad depot. There were many reasons which prompted the Committee of Arrangements in their selection of this hotel, not the least of which is that the hotel is run on both the American and the European plans, thus making it acceptable to a larger number of the members than a house would be which is conducted exclusively on the American plan. The hall for holding the meetings has not yet been decided on. There are, however, two excellent places near the hotel, one of which will doubtless be accepted. This, as well as other matters of detail are being considered by the Committee of Arrangements, which has been divided into several sub-committees, each of which has been charged with some specific duties. The members of the Association may feel assured that, by this division of labor, everything will be done for their comfort and enjoyment during their stay in Philadelphia.

Turning to the literary part of our programme, I cannot but express my regret that members have been so dilatory in sending in the titles for their papers. While there are several essays promised, I am only able to announce the following titles at present:

"Gas Commissions."
"Iron Holder House."
"Three-Hour Charges."
"Condensation."
"Suggestions upon Candle Power and Illumination."

I trust that the members who have promised papers will send their titles to me at an early day, so that I may be able, ten days hence, to publish a full list of the themes to come before the convention; for it is only by giving this information to the members in advance of the meeting that we can have discussions of any value. C. J. R. HUMPHREYS, Sec'y.

THE PHILADELPHIA MEETING.

Secretary Humphreys, through the vehicle of the official notice which appears in this issue, announces that the dates appointed for the Fourteenth Annual Meeting of the American Gas Light Association have been set for the 20th, 21st and 22d days of October. Mild and mellow October will no doubt witness a great gathering of the gas men in the City of Brotherly Love at the period designated, and it is equally certain that the outcome of the sessions will be sure to result in a decided gain to the fraternity, no matter from what standpoint that outcome be viewed. In fact, although the Secretary, at the date of compiling his last official information, announced his inability to then name the titles of more than five papers now in preparation by their authors, the titles of those given furnish ample guarantees that the time devoted to the literary divisions of the sessions will be replete with interest. First on the given list we note a communication on the subject of "Gas Commissions." This is a most encouraging sign, for, as a general thing, the members of the parent association, always excepting those who have occupied its presidential chair, have seemingly manifested a disinclination to address themselves seriously to a critical discussion of this most important question. We have not the slightest idea whether the promised thesis will be in favor of or in opposition to the principle or plan involved in the proposition to establish such inquisitorial bodies; and in fact it is not of any great moment *per se* on which side of the argument the at present unknown (to us) author aligns himself. The primal object is to have the matter brought formally before the Association, and, with that successfully accomplished, the after discussion will thoroughly test the opinions held by

the fraternity anent the points mooted. It has been our pleasant province to have attended many gatherings of our professional brethren "when on duty bent," and out of them all we cannot remember a single discussion which exceeded in earnestness and vigor that which followed the reading, at Columbus, last May, of the majority and minority reports of the special committee designated by the Western Gas Association, in May of 1885, to investigate the question. A free interchange of opinion was solicited, and our report of the discussion must bring home to all a conviction that such solicitation was not made in vain. We, therefore, entertain the utmost confidence that the Philadelphia assemblage will go a very long way towards framing, in one way or another, a national verdict upon the polity or impolity of the commission scheme. Number two we find is catalogued as a dissertation (perhaps we might better have said description) on an "Iron Holder House." Having a strong suspicion that we could "guess out" the member who will supply this particular paper, but without any precise naming of the author, since the telling would include us in the ranks of those who rely upon private conversation for their subsequent "spread of knowledge," we violate no confidence in proclaiming that the "Iron Holder House" author is amply qualified to treat his fellow members to a most interesting technical discourse. Next in sequence comes a contribution on "Three-Hour Charges." And in this do we discover another most encouraging sign. When the members of our technical bodies are asked to prepare and present papers at the congresses of their societies, the reply is often made, "I would willingly do so but for the fact that every possible subject of interest has been completely gleaned." But a more absurd misstatement could not be made. Mr. "X," for instance, may have, to his notion, "gleaned" some particular section of the gas field in the most Ruth-like fashion, but Mr. "Y.," whose ideas are entirely at variance with those of his brother, "X.," could follow in "X.'s" very footsteps and garner up a goodly share of straws headed by bead rolls of sound grain. Take, for instance, the discussion, carried on not long since between Mr. A. B. Slater, of Providence, R. I., on the one hand, and the London *Journal of Gas Lighting*, on the other—on this very subject of three-hour charges, too. Who will gainsay that these were not worthy foemen; and who will assert that either participant engaged in the colloquy merely for the sake of consuming time? Both were anxious to defend their respective positions, and the net result of the fray, if that designation may be given to a discussion carried on in the best of spirit by parties only desirous to become convinced as to whether or not error existed in their respective practices, has been profitable to all who kept pace with its chapters. We are told there is nothing new under the sun, and we must perforce concede that that regal luminary is invested with surpassing ancientness; but the old saying loses much of its pointedness when one remembers that every day we discover new ways to perform old practices. So, after all, it is but a question of willingness and application. Therefore we hope those who have hitherto been convinced that the "end of description" was reached will take heart of grace and, while doing themselves justice at last, will at the same time perhaps lift a brother gas man out of the slough of temporary despond. Gas men should further remember that neither the language of an Addison, the elegance and precision of a Macaulay, nor the wit of a Jerrold need be displayed or portrayed in the compilation of their themes. Far from it; all that is needed or wanted in the premises is a clear, matter-of-fact, or even homely description of the experiment, theory or plan which they undertake to reproduce in ink on paper.

The fourth paper promised is to bear upon the subject of "Condensation"—and a right important theme it is. In this field there certainly exists much wheat as yet ungarnered; in fact we might say that the reaper's work therein has yet hardly begun. In this country, at least in so far as the greater portion of our territory is concerned, the question has not received that cool, calculating attention which it rightfully deserves; and, not to mince matters, in many of the smaller works no consideration whatever has been bestowed upon it. In these days of low selling rates every detail must be carefully looked after, so that both ends may be brought together without any undue stretching of the bands; hence does it seem that those who were long satisfied with "letting well enough alone" must soon be prepared to face the inevitable. Either that, or else to stay the threatened disaster by now putting forth their best efforts in an attempt to repair the ravages occasioned by the carelessness of the past. The last paper on the Secretary's initial list is named to deal with "Suggestions upon Candle Power and Illumination," and we take it that this is a most likely subject to interest the convention. Judged by the success which has, during the past few years, attended the efforts of inventors to develop the inherent lighting value of the gas man's product after it has passed from the direct control of the latter's hands, we may reasonably expect far greater achievements in similar lines in the future. Certainly inventors cannot any longer claim that the gas makers view their researches now with listless indifference or conscious apathy. Far from it; and those who have experimented successfully in the line of perfecting improved gas burners, etc., must of necessity confess that the gas makers are really more eager to secure for the gas consumer a better lighting result than was formerly obtained from equal quantities of gas burned than the latter appears to be to receive the increase. And the unprejudiced observer may perhaps be forgiven for saying that such is one of the anomalies connected with the gas industry never made public during the taking of testimony at times of so-called gas investigations—be the latter conducted by Senators, Assemblymen, Boards of Aldermen, or Gas Consumers Associations.

It is not to be understood that Secretary Humphreys' initial list of papers embraces all or even the major part of those to be presented to the Quaker City gathering. Many others have been promised; and we would place especial stress upon his request that intending contributors forward to him the titles of their proposed contributions at as early a date as possible. The wisdom and obvious usefulness of a speedy compliance with that appeal are made manifest by the closing sentence of his second official gun of the campaign.

President Wood has been and is actively engaged in the work of arranging the preliminaries, and an admirable subdivision of the Committee of Arrangements into minor committees, each with its allotted tasks to perform, has been effected. This simplification insures the maximum of a happy final effect for the comfort and pleasure of the members. And the latter should not forget that the best way in which they can show an appreciation of the efforts put forth by their representatives above named is to pay faithful heed to the duties connected with their membership.

Since receiving the "copy" of the Secretary's notice the telegraph informs us that the business sessions of the Association will be held in the *foyer* of the Academy of Music; also, that the banquet will be served in the elegant dining room of the Union League Club. These selections are simply unsurpassable in every particular, and speak volumes for the *finesse* of the gentlemen in charge of the preliminary arrangements.

THAT WASHINGTON INVESTIGATION.

Within the fortnight a Washington (D. C.) correspondent kindly forwarded us copies of the pamphlet containing the testimony taken before the Senate Committee that investigated the affairs of the Washington Gas Light Company. The pamphlet (it numbers 163 pages) contains a most remarkable collection of "testimony," and some portions of it are amusing in the extreme. Among the "experts" who volunteered testimony may be mentioned a certain Mr. W. C. Dodge, who is evidently a "chronic growler" of the most pronounced type; the venerable Mr. Jas. Crutchett, who is familiarly known in this city amongst the fraternity as "the man with a grievance," and Mr. W. Fitz Charles McCarty, who, when asked, "Have you ever manufactured gas yourself?" made answer, "Yes; in Moscow, Russia;" and who also subsequently figured it out that two roubles were equal to one dollar. These and others of the same sort, and all with an axe to grind, are the parties who fed the Spooners *et al* with gas pap. All Washington, however, does not assent to the Dodge-McCarty-Crutchett *menu*, in proof whereof we reprint the following, from the Washington *Herald*, date of August 15th:

"Great Britain has perfected a system for the incorporation of gas companies after the experience of many years. Under her system, as developed and improved from time to time, newly-incorporated gas companies are permitted to make a maximum dividend of 10 per cent. on a given amount of capital stock, after paying all the ordinary and extraordinary expenses of the corporation, including interest on the bonded debt. Recognizing the uncertainties attending business of this character, Great Britain, where capital is more plentiful than in any other country in the world, and where the rates of interest on money as well as the average annual percentage of gain on other investments is lower than in any other mercantile community, has fixed the annual profits on gas investments at 10 per cent. But Senator Spooner is wiser in his generation than the conservative Englishmen. He has reported to the Senate, confessedly without any evidence to sustain him, that gas can be furnished at $1 per thousand feet and give the Washington company sufficient profit to pay seven per cent. on its present capital stock. Perhaps this may be so. A careful reading of Senator Spooner's report and the so-called evidence accompanying it, however, fails to show any testimony to sustain the assertion. Be this as it may the bill to restrict the company to seven per cent. on its present capital in any one year assumes an arbitrary rate, and does not provide for years in which no dividends may be earned. Thus the company might earn this year 15 per cent. and next year nothing. Under the bill they could pay only 7 per cent. for the one year and nothing for the other. This would work unjustly and unfairly. Again, the Spooner bill is so crude that it does not provide for any increase of capital for the extension of plant, which is annually necessary, and which, under the bill, could not be made out of the profits of the company. Take it all in all, here is one of the rawest pieces of legislation ever attempted. That it will fail is pretty certain. It will not stand discussion. What the people want is legislation which will last, not mere crude and temporary enactments to be altered in the interest of the community or the company, as Congress may from time to time be swayed by varying influences."

Utilization of Residual Products in Gas Works.

[A paper read by Mr. J. T. Lewis, of Wellingborough, England, at the Twenty-Third Annual General Meeting of the British Gas Institute. Reprinted from the *Journal of Gas Lighting*.]

No subject at the present time is so deeply interesting to those who are engaged in the manufacture and sale of gas as that of residual products; and this is especially true with regard to two of these—viz., tar and ammoniacal liquor. What a change has taken place since the late Sir William Siemens, in his presidential address before the British Association at the meeting held at Southampton, in 1882, made the extraordinary statement with regard to the value of gas works residuals, that these were worth nearly £3,000,000 more than the raw coal cost. Of course, this was an error; for, even assuming that the products he named were utilized, they did not at that time produce the revenue he supposed they did. But at that period it was accepted by many as a fact that gas companies and local authorities who owned gas works were making a large profit out of the residuals alone, and consequently the gas ought to be almost given away.

As I have already said a great change has taken place in the value of our residual products. Gas is, and I feel sure will always be, the article manufactured, and will never be, as many thought it was at the time I have referred to, the bye-product. Undoubtedly then, and a year or two afterwards when residuals were at their highest value, the revenue derived from these did form a most important item in the accounts of a gas undertaking. But now, owing to the extreme depression that has taken place in the chemical trade, the prices realized by the sale of the products (and frequently they cannot be sold) are so extremely low that it is very depressing to the hopes of all managers who are anxious to keep down the price of gas at the lowest point, and yet show a balance on the right side of the accounts; and it is in the hope that I may, if only in a slight degree, assist those who are unfavorably placed for the profitable disposal of their residuals, and at the same time do something to help onwards the complete utilization of these, and as a consequence improve their value, that I have ventured to read this paper. I do not claim any great novelty in what I am about to bring before your notice; and I hope you will all extend to me your kind forbearance if I should fail in accomplishing what I desire.

In looking over the excellent list of suggestions sent out by the Secretary of this Institute, I felt that the subject of residual products was in particular suitable for the present time. Many managers have been, and still are troubling themselves with the question, "What can I do with my coke, tar, or ammoniacal liquor (as the case may be) to make them profitable?" and it is for these more especially that my paper is intended; for I know, and doubtless many of you also know, of gas works so situated that the ammoniacal liquor costs more for carriage from the works than what is paid for it by the buyer. Indeed, in the case of small village works, the liquor has to be thrown away and got rid of with as little nuisance as possible; and yet it should be worth in all works, large enough to manufacture sulphate of ammonia, at least 8s. per ton. As I wish to say something about each of the products—coke, tar, and ammoniacal liquor—I propose treating them in the order here given, which is their order as regards money value per ton of coal carbonized.

Coke.

With regard to this product, I have very little to say; and that little is simply to point out to those who have not yet commenced the supply of broken coke the advantages of doing so. In all matters where there is no question of right or wrong involved, I suppose the inquiry, "Does it pay?" is to be taken as the test, in commercial questions, to work by. In this matter I can speak with the greatest confidence, and say that it does pay, and pays well, to supply broken coke; and I hope to prove to you that it not only benefits the individual company, but that it benefits the whole community of gas companies at large.

In the first place, the local sale of coke is increased; and, in the second, as a natural consequence of this enlarged local trade, the average price realized per ton is also increased. The reason for the increased local sale is on account of the fact that the broken coke is applicable for many purposes that the large is not—such, for instance, as kitchen ranges, slow combustion stoves, smith's forges, etc. Well, if this increased local demand takes place (as it does), what is the result? It is this: That the very large quantity of coke which formerly was sent into neighboring or even distant towns is now required at home; and, as a consequence, this allows other gas works a better opportunity of selling their coke. I think this fact must appeal to everyone who has difficulty in selling his coke at home; because, as you are all well aware, if the home demand is not sufficient to take the coke, it must be sold at almost any price to get rid of it. But independently of the price realized, it seems so unfair to home customers that the system of sending away large quantities of coke at a low price, and yet keeping up the charge to a much higher figure for that required at home, should continue. Would it not be much better to reduce the price for the home supply, and thus keep a constant demand for coke in the district? In one works I am acquainted with the coke could not be sold for several winters, but the price was reduced, and all customers paid the same rate for it; the effect being that the company do not have sufficient coke to supply the demand. I should say that in this case the great bulk is sold in small quantities.

I will give you an instance of how this affects the company with which I am connected. Our retail price for coke is 12s. per ton of 20 cwt. But in several towns, within a reasonable distance of Wellingborough, coke has been sold at 6s. per ton wholesale; and this, in some instances, has been disposed of in the latter town during the past winter at 11s. per ton, and could be sold at that price with as much profit as is obtained by buying direct from us at the wholesale price. In consequence of this we are compelled to keep down the wholesale price or lose the trade. Owing to our large sale in broken coke this is not so serious a matter with us as it might be in the case of many other gas companies. Up to the last few years we have been compelled to get rid of our stock in the same manner; but if our home trade keeps up (as I have no doubt it will), there will be no necessity to do so in the future. It is to this point that I wish more particularly to call your attention; for if all gas works would adopt the system of supplying broken coke, and thus foster an increased home demand, the result would be that in a few years very few companies would be compelled to go outside their own district for the disposal of the coke made. This being so, I am sure it will need no words of mine to prove to you that an increased price would be obtained for all coke sold. I would most strongly urge everyone, who has not done so, to give this a fair trial; and if the benefits to be derived from the use of broken coke are made known to the consumers, and the sale of this article pushed in the same manner as coal or any similar article is, I am quite sure the results will be in every case satisfactory to all concerned.

To my mind there are at the present time special reasons why this class of trade should be encouraged to the fullest extent, for we have an enormously increased quantity of coke for sale as the result of tar being used as a fuel for heating retorts, and of the increasing efficiency of the arrangements for heating retorts, owing to the use of generator and regenerator furnaces; these sources of additional coke for sale being independent of the annually increasing quantity put on the market through the steady increase in the amount of coal carbonized.

With regard to the cost of breaking coke, I find that the cost in our case is about 8d. per ton; and to this must be added the difference in the value of dust made in breaking, which is about 4d.—making the total cost 1s. per ton. The extra price obtained for broken over large coke is about 2s.; thus giving a net gain of 1s. per ton. The item for breaking I hope to reduce this year by having some alterations in the method of feeding the breaker with the coke. The cost of our machine, with screen complete, was about £20—the power required being from 1 to 2 horse; and for this purpose I should recommend a gas engine.

With the machine we have in use about 4 tons of broken coke are turned per hour. The framework of the machine consists of two **A**-frames, held together by two sets of cross-braces and connecting plates. The frames have parallel slots which receive the roll bearings, and are confined to their places by the connecting plates, one of which has a set-screw at each end for adjusting the bearings. The other plate has a slot at each end, through which projections from safety caps pass and abut on the other two roll bearings. Should any solid or hard substance by mistake pass through the mill, these caps (costing 6d. each) would break, and thereby preserve the more expensive parts from injury. The bearings and the rolls are prevented from getting too close together by means of packing pieces passing through holes in front of same; and the set-screws when tightened lock these firmly together in position, thus preventing jar and chafing, and gauging the rolls at the desired distance apart. A cast iron hopper surmounts the whole, and is held to the framing by bolts. A spout with its outer end projecting into the screen passes diagonally under the machine. The rolls are circular, with eight ridges running the whole length. There are twelve square holes through each roll; and in these are keyed 24 teeth, each key fixing two teeth. Two small cheeks are bolted at the ends of the rolls at the point where the greatest wear takes place. On the rolls are keyed two cog-wheels gearing into each other. On the end of one spindle is keyed the driving pulley, and on the other a pinion gearing into an inner toothed wheel fixed inside, and at the end of the screen. The screen is perforated for the first half of its length with holes $\frac{7}{8}$ inch in diameter, the other half with holes of $1\frac{3}{8}$ inches diameter—the former passes the dust, the latter the coke used by smiths, etc. The remaining coke passes out at the end of the screen, and is used for kitchen ranges, etc. This screen has a central spindle working into a bearing at each end; one of these is fixed to the machine, the other to an independent bracket, vertically adjustable. One of the salient points of the machine is that its main wearing parts—the rolls, teeth, end cheeks, and the roll spindles with their bearings—are chilled. Another point worthy of notice is the accessibility of its parts. The teeth can

be driven out and replaced (at about 2½d. each) without removing the rolls. The rolls can be withdrawn without taking the frame apart, and the chilled cheeks by taking out one bolt from each. The chief end to be kept in view in breaking coke is to make as little dust as possible; and to accomplish this it is necessary that the coke should be split and not crushed. The picked form of teeth used in this machine meets the requirement.

Tar.

This product has undergone such a change that its market value, which varied between 1s. 8d. and 3s. 4d. per ton of coal carbonized in 1883, is now only worth from 4d. to 7d.; and, I believe, in some instances even less than this is obtained for it. Whatever may be the cause of this—whether overproduction or otherwise—the fact remains that tar, which so easily sold at a good price a few years ago, is now scarcely salable. In consequence of this many of us have been caused much anxiety as to what we can do with this article to make it of some value to us.

There are several methods of utilizing tar, which I wish to bring before your notice. These are: For the purpose of distillation, for use as a fuel, for asphalting, and for the manufacture of patent fuel. During the past year I have often felt a desire to know what was the real value to tar distillers of tar for distillation. With this object in view I have made inquiries; and, by the kindness of some friends, I am enabled to give you the results of distillation. These statements have been obtained from two different tar distillers, one of whom, as you will see, carries the process further than the other. The value of the products is put down as given in the *Journal of Gas Lighting*, at the date of writing this:

Products from One Still of Eight Tons.

Naphtha	60 gallons, at 9d. per gallon		£2	5	0
Light oil	60 " at 3d. "		0	15	0
Creosote	500 " at ¾d. "		1	11	3
Anthracene	1 cwt.		1	11	8
Pitch	5 tons, at 15s. per ton.		3	15	0
			£9	17	11
Wages on the above		£2 0 0			
Coals		0 6 0			
			2	6	0
Wear and tear, rent, etc., not known					
			£7	11	11

Giving the value of one ton as nearly 19s.

Products from one Ton of Tar.

Benzol (50/90)	5 gallons, at 1s. 5d. per gallon		£0	7	1
Naphtha	2 " at 9d. "		0	1	6
Carbolic acid	5 " at 1s. 8d. "		0	8	4
Creosote oil	50 " at ¾d. "		0	3	1½
Anthracene	30 lbs. of 35 per cent.		0	8	0
Naphthaline	2 cwt., at 3s.		0	6	0
Pitch	11 " at 9d.		0	8	3
			£2	2	3½
Sulphuric acid, caustic soda, slack, and labor for working			0	10	6
Wear and tear, rent, etc., not known					
			£1	11	9½

It is not possible in either case to get the real value of the tar, for in both the charge for wear and tear, interest or rent, and part expense of management is not given; and these, as some of you know, would be a considerable item in works of this description. From the last case it appears quite clear that the distillation of tar is the most profitable when carried to the full extent. From inquiries made it is certain that the distillation of tar cannot be carried on in a gas works at a profit where the annual quantity of coal carbonized is much less than 30,000 tons; for the turnover in a works using less than this quantity of coal would not be sufficient to pay a competent man to look after it. I think the above statements show clearly that tar is not at the present time very valuable to tar distillers for the purpose of distillation.

As regards the value of tar as a fuel, I think it may be taken as a standard that if tar is worth 15s. per ton for the purpose of fuel, then that is the right thing to use it for; and I am sure the thanks of all interested in the well being of gas works should be given to those who took the first steps in this direction. It is not my intention, however, to take up your time with a description of the various methods adopted for heating retorts by tar, as these have been so ably described in the *Journal of Gas Lighting*, all appearing to give satisfaction to their users in working, and what is of great importance they are equally successful in attaining the desired end of improved value. The value of tar as a fuel must depend upon the situation of the works, the value of coke and its disposal. When coke is selling at 5s. per ton, and tar at 7s., one can be sold as profitably as the other; but in the great majority of cases it will pay better to sell coke than tar.

I will briefly review some of the published results obtained by the use of tar as a fuel instead of, or in conjunction with, coke; and these cases will illustrate the varying values of coke and tar in different localities:

		s.	d.
(*a*)	Cost of coke for one furnace per 12 hours	7	4
	" " and tar for furnace "	5	2
	Saving	2	2

Showing a saving of 4s. 4d. for each furnace per 24 hours.

		s.	d.
(*b*)	Coke saved in 24 hours, 1 ton	16	8
	Tar used, 90 gallons, at ¼d. per gallon	3	9

Showing a saving of 12s. 11d. per 24 hours. Tar equal as fuel up to 2d. per gallon.

		s.	d.
(*c*)	Coke saved, 13 cwt., at 4d., in 24 hours	4	4
	Tar used, 68 gallons, at 10s. per ton	3	5

Showing a saving of 11d. for each furnace per 24 hours.
Tar value, 12s. 9d. per ton.

(*d*) A saving of 2s. 6d. per 24 hours; but no particulars given.

I will now take the subject of the utilization of tar for the purpose of manufacturing asphalt. This manufacture is carried on in some gas works with considerable profit; and I think if gas works generally adopted the same course, it would prove not only a source of direct profit, but would be profitable indirectly through the reduced quantity of tar for other purposes. I think there can be no question as to the profit. From the experience in gas works where the manufacture is carried on, it is proved to be the most profitable way of utilizing tar. At one works I may mention £200 worth of asphalt was laid down in one-half year; and this yielded a profit, after paying for manufacture and laying down, of £117. In another case, where the manufacture is carried on independently of the ordinary business of the company, a bonus is paid to the shareholders out of the profits. In no instance have I heard of this being a failure; the chief requisite being a knowledge of the distillation of tar to the point of which it should undergo distillation before mixing with the materials to form asphalt.

The Wellingborough Local Board have made asphalt for a number of years, and used it for foot paths and other public purposes with the most satisfactory results; and the asphalt is of excellent quality and has great wearing properties. It is made with a material which is the refuse of iron furnaces—viz., slag. This is broken and screened into various sizes to meet the requirements of the work it is intended for. The Board's method of distilling the tar is a very crude one. They use open boilers holding about 10 cwt. each, and allow all the products of distillation to escape into the atmosphere. With this exception their arrangements for the manufacture are excellent. They have a large shed, in which the broken slag is stored, dried, and screened into various sizes; and running through this shed from one side are flues heated by means of an ordinary furnace. The flues are covered with iron plates, which form the floor for mixing the asphalt. The broken slag is laid upon these plates and heated before being mixed. When the tar is of the proper consistency it is poured upon the material, and the whole thoroughly incorporated. It is then ready for laying down; and this must be done as quickly as possible, or the asphalt will set and become unmanageable. The time taken for distillation depends entirely upon whether the tar is light or heavy. If a light tar, it may take 12 hours; or if it is heavy, it may be ready for use in about 4 hours.

As far as I know asphalt from gas-works tar has not been used for the purpose of forming the surface to the streets and roads; its use stopping at footpaths. I have often thought of this matter; and it appears to me that asphalt of good quality, and made with suitable material, should prove in practice to form an excellent road, and one of great wearing capabilities. There is one point in connection with the wearing of asphalt after it is laid down, and which greatly affects its permanency. It is this—after the asphalt has been down a few months, it should be painted over, with an ordinary sweeping brush, with a coating of good hot tar and some dry dusty material. This has the effect of preserving the surface of the asphalt, and fills up all cracks or loose places in it. If this is done once or twice a year, according to the wear upon it, the asphalt is very durable, as I have proved by using it for roads and floors in coal-sheds, etc., in our own works. In a recent article in the *Engineer* on the subject of road and street paving, the question of asphalt was very favorably considered, and was preferred to wood paving and macadam for this purpose. No doubt the writer was referring to natural asphalt; but I hold that a road may be made as durable with asphalt from tar, and with proper after-supervision, as from any other material. The charge for asphalt is generally about 1s. per square yard; but, of course, it differs with the thickness of the asphalt employed. If 3d. per gallon is charged as the cost of manufacturing the asphalt, then at that price it will return a good profit. In one case the manufacture of asphalt gave a return of 8d. per gallon of tar used as profit.

The drawing which I have here shows a small tar plant especially adapted for the purpose of distillation on a small scale, suitable for asphalt manufacture and other similar purposes. The still will take a charge of 6 tons of tar. In the distillation of tar for this purpose, the products would consist of ammoniacal liquor, crude naphtha, and light oil; the distillation being stopped

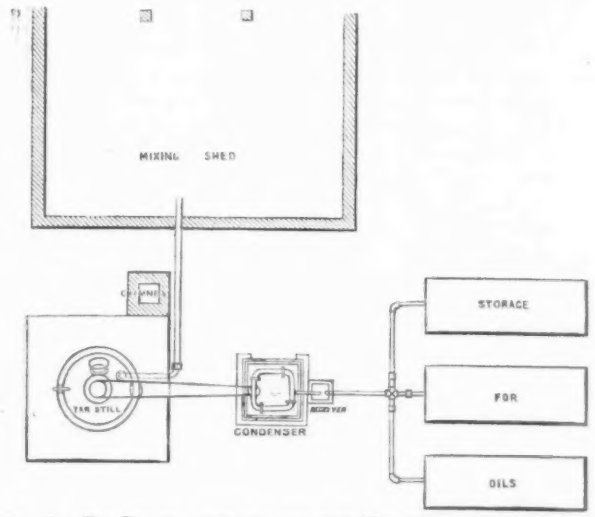

Fig. 1.—Tar Plant, suitable for the Manufacture of Asphalt.

before the heavy oils or creosote comes off. The tar is then in the condition of what is termed asphalt, and is the most suitable for the purpose of manufacturing this material. If the process is carried further, and part of the creosote oil distilled off, a soft pitch is made; and if the distillation is continued until the anthracene oil is given off, then hard pitch is formed. For the purpose of asphalting, the process is better stopped before the creosote oil comes of; but should it be desirable to carry on the process for the removal of the most valuable constituent—anthracene—then the heavy oils, freed from their valuable components, as phenol and anthracene, must be pumped back, if the residue in the still is intended for asphalt.

Another method in which tar might be extensively used is for the manufacture of patent fuel. Both hard and soft pitch is used very extensively in France and Belgium for this purpose, mixed with either small coal or coke; the production in these countries alone being 1½ million tons per annum. Up to a short time ago, there only existed, I believe, four works in this country where the manufacture of patent fuel was carried on; the production being about 300,000 tons per annum. It is not my intention to deal with this part of the subject, except in reference to the manufacture of breeze or coke dust into a patent fuel.

The immense quantity of dust in some of our largest works, made by the crushing action going on in large heaps of coke, and to get rid of which great difficulty is often experienced, should lead to a careful consideration of this matter, and to the conversion of this as well as the breeze into fuel by the admixture of tar or soft pitch. The only information I have of this manufacture having been undertaken in gas-works is from Mr. George Anderson, and also from Mr. Donaldson, of Walton-on-Thames, who was Manager for Mr. Anderson at the Dover Gas-Works at the time this fuel was made there. The fuel was manufactured by means of the latter gentleman's patent-fuel machine, in the following proportions:

	T.	C.	Q.	Lbs.	s.	d.
1 chaldron of breeze, at 2s.....	1	1	2	7	2	6
40 gallons of tar, at 3d.....		4	1	11	10	0
Labor for working		....			1	8
Coke as fuel		....			0	8
Total.....	1	5	3	18	14	10

The cost of manufacture was 11s. 4d. per ton, with tar at 3d. per gallon. With tar at a lower price, the cost of manufacture would, of course, be proportionately lower. By the kindness of Mr. Anderson, I have a sample of the fuel here. This fuel was used in the retort furnaces and steam-boilers, etc.; and I am assured that it will last double the length of time that coke does for this purpose. When made of tar, the fuel sets quite hard in a few days.

Ammoniacal Liquor.

I have now to call your attention to the utilization of ammoniacal liquor by converting it into sulphate of ammonia. The question of the profitable disposal of this product is one that has troubled the minds of many managers during the past two years, and has in some instances resulted in a determination to erect plant for the manufacture of sulphate of ammonia. Some seem as if they are not quite sure that this is the right thing to do; and the consequence is that at the present time they really obtain no income from this source. If such is the case, I hope I may be able to convince those who are wavering between a desire to undertake the manufacture of sulphate, and the fear of any evil consequences attendant upon so doing, that they may fearlessly undertake the duty—for such it must be under the above-mentioned circumstances. But they must, however, in the first instance, take such necessary precautions in arranging their plant that no possibilty of a nuisance can arise. No doubt in some districts—as, for example, a thickly populated, or fashionable and residential town—the fear of creating nuisance is a very important matter; and if this could not easily be guarded against, then it would be much better not to incur such heavy responsibility. When we take into consideration the question as to which is the more profitable, to sell the liquor or manufacture it into sulphate of ammonia, I think there can be no doubt whatever that, even under the most favorable circumstances, it pays better to manufacture into sulphate than sell the liquor. There is only one exception to this, and that is in the case of a gas-works being in close proximity to a chemical-works, so that a pipe can be laid from one to the other for the purpose of running the liquor, and thus save any cost for carriage. It may answer the purpose of the chemical manufacturer to pay nearly the full value of the liquor. It is only in such a case that it might not be advisable to undertake the extra duties and responsibilities incurred by this manufacture.

The plan of works and plant which I have here represents those which I have in use, and which has been found to work well, and to meet with the full approval of the Inspector under the Alkali Act. The ground plan shows the entire arrangement. A is the steam-boiler; B, the still; C, the saturator; D, the settling-tank; E, the evaporator; F, the drainers; and H, the stores for the sulphate. The still is a cylindrical boiler, strongly made and fitted with gauge-glass for showing the height of liquor, safety valve, and vacuum gauge, and is furnished with an agitator running from front to back; which is fitted with paddles for the purpose of agitating the liquor. The liquor is pumped into the still from the store tank, which is about 80 yards away, by means of a pump at J. Steam is blown into the

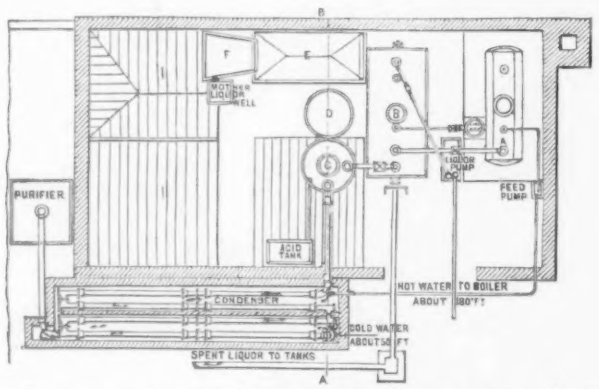

Fig. 2.—Sulphate of Ammonia Plant at the Wellingborough Gas-Works.

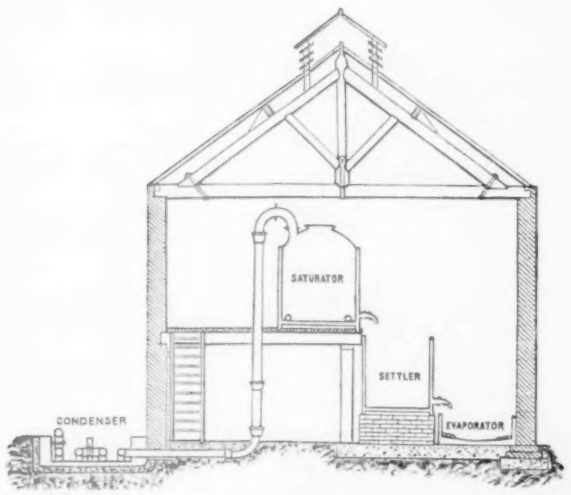

Fig. 3.—Section of Sulphate of Ammonia Plant, on line A B of Fig. 2.

still from the boiler by means of a 2-inch perforated pipe, having two branches running the whole length of the still. When all the free ammonia is driven off from the liquor, milk of lime is introduced into the still from the lime-box. When this is done, the whole is well agitated in the still;

and this releases the fixed ammonia. The gases as they leave the still are passed into the saturator, which is constructed on the closed system, and is charged generally with about 8 cwt. of dilute brown sulphuric acid of about 48° Twaddel. This absorbs the ammonia and allows the foul gases—sulphuretted hydrogen and carbonic acid—to pass away into the condenser. The acid, when properly charged with ammonia, is run out into the settler. This is done to enable any dirty or muddy matter to settle; and when this is clear it is run out into the evaporator, where it is evaporated into sulphate. When this is formed it is thrown upon the drainer to dry, and from there to the sulphate stores ready for bagging up. The foul gases, as they leave the saturator, pass into the condenser. This is formed of 6-inch cast-iron pipes laid horizontally in a water-tank, as shown by plan and section on the drawing. This water tank is divided in the centre by means of a brick partition; and the pipes are arranged as shown. The hot gases enter the condenser from the saturator at *a*, and pass away thoroughly cooled at *c* into the purifier, which is charged with oxide of iron. The cold water enters the tank at *b* at about 50° Fahr., and passes along the pipes around the partition wall down to the point *a*. Where the hot gases enter at this point the water is about 180° Fahr.; and from here it is pumped into the steam-boiler by a small pump. By this means we most effectually condense the foul gases; and, in addition, utilize what would otherwise be waste heat, and this means a considerable saving in the fuel account and attendance. After the liquor in the still has been treated with lime and the ammonia driven off, the waste liquor is run from the still into the settling-tanks, of which there are two; each being large enough to hold the waste liquor from 24 hours' distillation. By a suitable arrangement of pipes, we allow the waste in each tank to stand 24 hours; and the outlet from each is of such a size that it takes this time to empty one, so that during the time one is being filled, the other is emptying itself. By this method the waste in each tank has time to settle any lime or other dirty matter that is in suspension. This is deposited at the bottom of the tanks. As the outlet from each is 1 ft. 6 in. above the floor of the tanks, no mud can be drawn out when emptying. After the waste leaves the settling-tank it passes through a small filtering-tank, which is partly filled with retort carbon, gravel clinker, etc., so as to prevent any dirty particles that might be floating on the waste from entering the drains. The apparatus, when in constant work, is capable of turning out 3 tons of sulphate per week, if liquor of 6° Twaddel is used. Our average weekly make when in use is about 2 tons; and this is accounted for by the fact that we only work from Monday morning to Saturday afternoon. The salt made is white and of good quality, and contains about 25 per cent. of pure ammonia. The whole arrangement is as complete as any I know of; it is easy to work, and, with proper management, gives excellent results. The total cost of the necessary buildings and all plant was about £600.

The following statement will give you the cost of making 1 ton of sulphate, and the profit to be derived at the present market price:

Acid, 18¼ cwt. of brown sulphuric acid of 1,730 sp. gr. at 67s. 6d. per ton	£3	2	5
Labor for manufacture	0	10	0
Lime	0	1	4
Fuel	0	5	9
Bags	0	2	6
Wear and tear	0	5	0
Total	£4	7	0
Present price of sulphate per ton	£11	10	0
Less cost of manufacture	4	7	0
Profit for liquor and interest on plant	£7	3	0

If we put the interest on plant and buildings at 10 per cent. per annum, this, on the outlay of £600, will give us an annual charge of £60; and supposing the make to be 120 tons per annum, this gives a charge of 10s. per ton of sulphate made. Deducting this 10s. from the profit made—£7 3s.—we have a result of £6 13s. as the net profit for the liquor used; and this gives us on 10¼ tons of 6° liquor, the value of one ton as 13s.

With regard to the disposal of the waste liquor, the arrangement I have in use for this purpose was adopted with the object of preventing, as far as possible, the pollution of a water-course into which our drains empty after leaving the works. The disposal of the waste liquor is one of the greatest difficulties we have to contend against in this manufacture; for it must be got rid of, and if the situation of the works is not a favorable one for its disposal, it may, if great care is not taken, become a soure of much trouble and annoyance. There are several methods in use for disposing of this waste liquor. One is to sink a kind of well in the ground, and run the waste or spent liquor gradually into it, and allow it to percolate into the underlying strata, and thus become filtered. This plan, as you will readily understand, cannot be applied in every case; for if the works are situated in some districts where the underground water is used for drinking purposes—as it is in many places—it may result in polluting the water, and thus lead to difficulties. In one case I know of, the water used in the gas-works has been rendered unfit for domestic purposes through this cause. I am afraid this would be the result in any instance where the water in the immediate neighborhood of gas-works is used for domestic purposes, and where the spent liquor from the works is treated in this manner. For although the liquor may pass through some medium that would filter it, and thus remove any impurities held in suspension, yet this act of filtration would not, except in rare cases, alter the constitution of it; and when it is borne in mind that a very strong solution of sulphuretted hydrogen from the condenser is mixed with this waste, as well as other impurities, it will be readily understood that if it comes into contact with water employed for domestic purposes, it will entirely spoil it for such uses. Another plan is to run the spent liquor at once into the sewers, if the gas-works is situated in a town well sewered; and this plan, when it can readily be adopted, seems to me to offer the most favorable facilities for its disposal. But even this has its risks, although they may be somewhat exceptional. In two cases where this method was adopted, the spent liquor passed into drains running through an engineer's shop. These drains unfortunately received all the hot water from the condensed steam; and the results were of an extremely unpleasant nature, the effect being that all brass-work on the engines, etc., was turned quite black, through the hot water heating the spent liquor, which then gave up its sulphuretted hydrogen. But independently of these risks in the disposal of this spent liquor, it is necessary that we should take every precaution that lies in our power to prevent the pollution of either underground or surface waters.

The question of the disposal of sulphate of ammonia is to my mind a very important one. I think you will agree with me that it is to the development of local uses for this that we must look to the future prosperity of the sulphate trade; and if we who manufacture this article in an agricultural district will do all we can to make its advantages known as a manure to the farming community, we shall assist, to a considerable extent, our fellow managers in manufacturing districts to dispose of their sulphate. The success I have met with in this direction has been beyond my expectation. In the autumn of last year I sent out to most of the farmers in the neighborhood literature treating on the use of sulphate for agricultural purposes, and accompanied this with a copy of the analysis of our sulphate; and early in January last I visited a number of the farmers at their homes, and also attended our local market on several occasions. By the end of February I had the pleasure of having no sulphate to sell; for I had booked all my make up to the end of April, which was about 40 tons. I had, in addition, inquiries which I could not supply. I should here like to make a suggestion to large makers who are not favorably situated for selling sulphate locally, as to whether it would not answer their purpose to make arrangements with gas managers—whether makers of sulphate or not—who live in agricultural districts to sell their sulphate for them. My own opinion is that this would answer. I was much surprised in speaking to farmers to find how few of them knew anything about sulphate. The great majority of them had not even heard of it; and I think this shows the necessity of circulating very freely literature which deals plainly with the properties and application of sulphate as a manure for various soils and crops. I hear very different opinions as to its value when compared with nitrate of soda; and I hope on some future occasion to give you the results obtained on various soils and crops.

With just a few remarks to those who may commence the manufacture of sulphate, I will conclude this paper. The plant I have described is complete in itself; but if any are so situated that the plant could be placed in proximity to the existing steam boilers, and there is a surplus of steam power, the cost of the plant might be considerably reduced, and in various ways the outlay on plant could be kept down. But whatever is done see that the condensers and purifier are each of sufficient power; for on these, to a great extent, depend the efficiency of the plant. I am quite satisfied that if these are sufficient for the work to be done, and the spent liquor arrangement satisfactory, the manufacture of sulphate can be carried on in comfort, and very profitably; for whatever may be the current price of sulphate, you may be quite satisfied that you are getting the full value from this product.

Discussion.

The President thanked Mr. Lewis for his very practical paper, especially for his concluding recommendation—that gas managers in agricultural districts should endeavor to make the farmers understand the great value of sulphate of ammonia as a manure. He had had two reports prepared for him by an eminent chemist; and it was his intention next year to act on the lines indicated by Mr. Lewis. He regretted he had not taken this step sooner.

Mr. G. Livesey said there were three points of importance in this paper; the first being the question relative to the sale of coke. There was a letter in the *Economist* a short time ago complaining very strongly of the practice of some gas companies selling large quantities of coke to foreign cement

manufacturers at absurdly low figures, while they charged the home cement manufacturers a very high price. A somewhat similar practice had been followed by gas companies or corporations selling coke to a greater or less extent in different parts of the country, in charging a high price to their own people, who ought to be served at the lowest possible rate, and selling it to outsiders at very low rates indeed. This seemed to him to be an unfair and unwise thing. If they were obliged to dispose of their coke at low prices, by all means let them sell it locally if possible, in order to stimulate its consumption for private purposes. Then as to the tar, this also was a very important subject; but it required a great deal of consideration before gas companies undertook its distillation. It was a very complicated business. As Mr. Lewis had put it, the further the process was carried, the greater was the profit to be obtained. But gas manufacturers had quite enough to do to attend to their proper business; and in attempting to become tar distillers they were very likely to come to grief. Then, again, when they had obtained the tar products they had to sell them; and, as far as his experience went—and it was confirmed by that of others—boards of directors and committees were totally unfitted for a business of this kind. Great disorder had been brought on the tar trade by incompetence in selling the product; and, therefore, he felt it required a great deal of consideration before any company or corporation went into tar distillation. The manufacture of sulphate of ammonia was a simple process. In selling liquor the contractor had to buy it at such a price as would enable him to pay the cost of carriage, to pay rent and taxes on his manufactory, to pay the increased cost of fuel required to work it up, and to leave him a profit. Mr. Lewis' figures agreed with some others given to him (Mr. Livesey) by a friend in London who had lately begun the manufacture of sulphate of ammonia. The result was shortly this: Taking Mr. Lewis' figures, the cost of making one ton of sulphate was £4 7s. He sold it is for £11 10s., leaving £7 3s. But if from this were deducted 10s. for the 10 per cent. interest on the value of the plant, it would bring the result to £6 13s. for each ton of sulphate. Of course, this included the value of the liquor, which at the present time he reckoned would be worth in London from £4 to £4 10s.; so that, by manufacturing sulphate himself, instead of from £4 to £4 10s. he obtained £6 10s., or about 50 per cent. more. In many places, as Mr. Jones reminded him, liquor could not be carted through a town, and even where there was water carriage this expense was saved, but where there was railway carriage the cost was much greater. The manufacture of sulphate, therefore, stood on a totally different footing to the distillation of tar products.

Mr. C. D. Jones (Chesterfield) could not quite agree with all that had been said by Mr. Lewis and Mr. Livesey. In some places, were coal was abundant and cheap, it was almost impossible to sell coke locally. A few persons might employ it for stoves in which coal was inapplicable because it created a smoke; and they would use a little in winter. The advice given to reduce the price to small consumers such as these was quite out of character when compared with the thousands of tons sold to the large manufacturers and dealers in coke. It was perfectly immaterial whether 2s. or only 2d. a ton more were charged. Consumers would not come at all if they could get a better material. He, therefore, did not agree with the *ad captandum* argument, that there should be a lower price for the local sales and a higher price for the large consumers. There was no doubt that gas coke was taking a position as fuel for blacksmiths' and for cutlery purposes, and so on; and it was in this direction that they would have to look for increased sales, and also for malting purposes, where it could be used without the cost of breaking. With regard to the use of tar, he was surprised that Mr. Lewis had never heard of its application to more purposes than he had stated. If he would make application to the York Gas Company, Mr. Sellers would send him a pamphlet which he had been distributing in his district, in which he would find some twenty or thirty purposes to which tar could be applied. The dissemination of this knowledge was very useful, and tended to further the interests of the producers of tar. Mr. Lewis said he had never heard of tar being applied for making roads; but he (Mr. Jones) could inform him that it had been so used in Chesterfield for at least 45 years, and was still being employed. In South Yorkshire and Nottinghamshire towns it was similarly utilized. For making macadamized roads it was one of the best materials that could be employed, inasmuch as it formed an impervious surface. The great object with road makers was to get the rain off the roads as quickly as it fell; and no material would answer this purpose so well as tar. But the ordinary rich tar from some coal would not make a good road; and it was therefore boiled, to drive off benzol at about 194° Fahr., and mixed hot with asphalt or stones, put on the roads, and rolled. This had been done, to his knowledge, for more than 20 years. The tar remaining after Mr. Hawkins's process was admirably adapted for the making of roads, because the lighter portions distilled over at the temperature he had named, and the tar was then in excellent condition for making asphalt. In the county of Derby, particularly in the neighborhood of Matlock where the limestone quarries were, they had established works for mixing asphalt with limestone; and it was even sent to London for footways, and when sprinkled with bright Derbyshire spar, would make the Metropolis more attractive, and a pleasant place to dwell in. The technical knowledge of farmers was very limited; and the dissemination amongst them of information with regard to sulphate of ammonia was very desirable. He had for many years followed this practice himself, with very excellent results; for while the author of the paper had sold his material at £11 10s. per ton, he (Mr. Jones) had been selling his locally at £12 10s. This showed that by the dissemination of knowlege with regard to the use of sulphate as a fertilizer, they had at command a market which had never yet been thoroughly cultivated. He must, however, remind everyone making sulphate of ammonia that local circumstances must be taken into consideration. Messrs. Newton, Chambers & Co., who had several large collieries, had been carrying on a process of distilling slack coal and converting the products into sulphate; but they had discontinued the process on account of the expense. The commercial value of the thing was what it would bring; and if gas managers could sell their ammoniacal liquor to a manufacturing chemist who carried the process further than they themselves could possibly carry it in their own works, it resolved itself into a question of pounds, shillings and pence whether it was cheaper to sell it to the chemist or work it up themselves, with the increased responsibility and liability which attached to the position of a *quasi*-manufacturing chemist.

Mr. D. Irvine (Maryport) said it seemed to him that it would be a very difficult thing to so arrange the quantity of liquor in the still and saturator that there should be no loss of ammonia on the one hand or of acid on the other. It must be very nicely adjusted so that the acid became completely saturated before it was run out into the separator. He should like to ask Mr. Lewis if he found any difficulty in adjusting it.

Mr. Lewis, in reply to Mr. Livesey's remarks as to the value of the liquor and the profit derived after manufacturing it into sulphate, said in their own case the value was about 1s. 6d. per ton of liquor of 6° Twaddel, out of which they paid 9d. for carriage. In one works in their neighborhood they had sold the liquor at this price under a twelve months' contract. With regard to Mr. Jones' remarks on the question of coke, he still thought that if that gentleman was to make the price about equal, and sell the coke at an average charge to large and small consumers alike, he would find a great advantage from it. On the subject of the utilization of tar, Mr. Jones seemed to have mistaken his meaning. He did not pretend to give a list of all the various uses to which tar could be applied, as they were so numerous, and it would simply be wasting the time of the meeting to do so. What he had done was to draw particular attention to the application of tar for the purposes named in his paper; these being, in his opinion, of a simple and profitable nature. As to the use of asphalt for roads, he did not know that it was employed for such purposes in any town, and the fact that it was so used in Chesterfield did not alter his contention that its use was not at all general; and it was the general application of asphalt for the formation of the surface of roads that he recommended. With regard to the price of sulphate, Mr. Jones had been able to get £1 more per ton than he (Mr. Lewis) had; but as during the past winter and spring he had first attempted to sell it locally to the farmers, he had to meet his customers with regard to the charge. If he had put too high a price upon it, he could not have sold it locally at all in some instances. One gentleman especially, who had a very good knowledge of this matter, would prefer nitrate of soda—that was, if he had to pay more for the sulphate than for the nitrate. With regard to Mr. Irvine's question as to the difficulty of arranging the charges of liquor and acid with only one saturator, he might say that at first they did experience some difficulty in this respect; but after a time, when the man became accustomed to working it, there was no trouble.

Mr. W. L. Scott Speaks His Mind.

The following is the reply made by the Hon. W. L. Scott to the resolutions, forwarded him by the Secretary of the Trades' Assembly of Western Pennsylvania, passed by those who are responsible for the strike at the Youghiogheny River Coal Company's mines. The Congressman's statements are calmly made, and put the miners in an unenviable plight:

ERIE, PA., Aug. 6, 1886.

To Mr. S. G. Gleffer, Secretary of Trades' Assembly of Western Pennsylvania: Sir—I received, addressed to me at Washington, D. C., your letter of the 17th ult, communicating certain printed resolutions adopted by a body you claim to represent, referring to the management of the Youghiogheny River Coal Company operating at Scott Haven, Pa., of which I am the President.

I assume this is what is meant, although you refer to me individually, and as operating as such in Washington county, Pa., neither of which statements are correct.

The resolutions are as follows:

"*Whereas*, Congressman W. L. Scott is attempting to subjugate his min-

ers by compelling them to sign an agreement that they will belong to no league, scheme or clique, or any organization whatever.

"*Resolved*, That we protest against the ignoble and tyrannical action of the said W. L. Scott, and hereby call upon him to at once cease boycotting men who are simply trying to better their condition by means of organization.

"*Resolved*, That a copy of these resolutions be forwarded to Mr. W. L. Scott."

From the evident pains taken, through newspaper articles and Associated Press despatches, in circulating misstatements of a like tenor as the above resolutions, I conclude they are presumably from the same source; and although I do not see clearly what concern the relations of the Youghiogheny River Coal Company are to you, or the body you advise being Secretary of, yet as your communication is the only avowed expression from any source so far received by me, I avail myself of the opportunity offered by it to make a general reply.

This is best done, as well to your as to all other misstatements, by giving a history of the actions of the miners at Scott Haven, and also of the company since the first suspension of work.

During January, 1886, a self-appointed meeting of miners and operators met at Columbus, O., and agreed for themselves to pay and receive from and after May 1st following, certain prices for labor, the chief one being 71 cents for each net ton of clean coal mined. Neither the Youghiogheny River Coal Company, nor, as I am informed, any of its miners then working, attended the meeting or were parties to its conclusions. Nor were the company's largest competitors, and whose mines adjoin those of my company, the Penn and Westmoreland Gas Coal companies, or their men, parties to that agreement.

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Shortly after the meeting, the Penn and Westmoreland companies advanced their mining price to 55 cents per net ton over a ¾-inch screen which was accepted by their miners for a short period only, all soon after joining in a demand for a further advance to 60 cents per net ton. This demand being refused, led on to a prolonged strike, beginning in February and lasting until June.

After the strike had been begun by the Penn and Westmoreland companies' men, and in order to aid them, the miners employed at all our mines—the product of which is more or less placed on the seacoast in competition with coal of the Penn and Westmoreland companies—notified our Superintendent that they would not mine, nor permit to be mined, any more coal, and withdrew in a body about March 27th. No question of price was made, but it was intended to be an indirect coercion of the Penn and Westmoreland companies to effect, if possible, the granting to their men the increase demanded, regardless of our interests.

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The terms and conditions contained in the contract signed by the men when they went to work were not materially different from what had been in force in our company prior to 1886, and which had resulted favorably for the men—the only change being as to the price paid for mining, which our company conceded should be the same price paid by the Penn and Westmoreland companies, which the men at our mines had always demanded.

These facts were recognized by nine-tenths of our men, who have been willing throughout to work provided they were protected in doing so, and to separate from those guided by designing leaders, who were bent upon the rule or ruin of them as well as the company. It was thought some action on the part of the company in recognition of such men, as well as looking to a more reliable service, should be taken; and as dealing with an organization was impracticable, owing to the stand taken, it was deemed best to deal individually with each man by means of a contract for his services, which had been our custom prior to 1886. After waiting through the lapse of a month for the men to resume work, which they had the option to do and steadily refused, all were discharged and paid off. They were then offered, without exception, the opportunity of individually returning to work, under protection, upon executing the contract.

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On July 21st all the opposition element, including the leaders, without urging but without objection on our part, came to the office and signed the contracts, the next day beginning work in No. 2 mine. On the third day after they elected, contrary to law, a man not employed in the mine as a checkweighman—one well known to have been dismissed for cause—and demanded that he be recognized. Answer was made that any unobjectionable man could stand and see proper weights and credits by our weighmaster, as at other mines then and now running, but that this discharged and improper person would not be allowed to do so. Against this assurance of our superintendent, and in violation of their contracts, all of them again left No. 2 mine, and are still out, thus committing a third hostile act against the company.

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Neither the company nor its officers are engaged in wars with organizations or men. It seeks to conduct its affairs peacefully and successfully. Its property belongs to me, as its trustee, to protect, as the labor of the miner is his. All that competition, the state of trade, a desire for the personal welfare of all, will permit or require, I will do freely, but under no circumstances allow its just and proper control to pass to those who have no interest in it, but who have so repeatedly shown themselves not only indifferent but hostile to its interests. W. L. Scott, President.

On the Preparation of Zirconia.

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Since that time there has been little demand for zirconia except for use instead of lime in lantern projection. The zirconia pencils 8 m.m. long and 5 m.m. in diameter yield a brilliant point of light especially well adapted for experiments in projection, as with the microscope attachment to the lantern, where great definition is necessary.

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As the result of these, the following method of procedure was devised:

North Carolina zircons, containing some iron, were heated to redness, quenched in water, and pulverized in an iron mortar. The powder was passed through a sieve of 100 meshes to the inch.

A proportion of sodium hydrate three times as great as that of zircon to be disintegrated was heated to fusion in a wrought iron dish over a common laboratory gas stove, and the zircon powder sprinkled in. The silicon seemed to undergo decomposition at once, though to insure this the fusion was continued at a dull red heat for half an hour.

The melt was next lixiviated. An insoluble residue consisting of zirconia, ferric oxide, and some silica remained. This was washed with water.

To separate iron this residue was suspended in water, and sulphur dioxide gas was passed through the mixture. What was left undissolved by this treatment was allowed to settle, the liquid above decanted, and the residue treated with fresh water and gas till only silica remained. The silica was removed by filtration, and the clear solution of sulphite boiled as long as sulphur dioxide escaped.

The granular precipitate of zirconium sulphite thus obtained was washed with dilute sulphurous acid water, at first by decantation, then on a filter.

The sulphite was white and granular, and not like that obtained when a solution of the chloride is precipitated by the same reagent. Unless a chloride solution is largely diluted the sulphite precipitated on boiling is gelatinous and utterly unmanageable.

It has been found objectionable to use sodium sulphite or hyposulphite on account of the retention of sodium by the precipitate. When much ferric chloride is present, as will be the case when the fusion is made in an iron dish, then the hydrochloric acid set free through its conversion into ferrous salt adds another source of trouble. Ammonium hydrate may be added in small quantities at a time to neutralize the free acid; but since the zirconium is thoroughly dissolved and separated from iron by sulphurous acid alone, after boiling, there is no necessity for converting the residue left after fusion successively into chloride and sulphite.

To free the sulphite from any traces of silica it was dissolved in hydrochloric acid, and the solution evaporated on a water bath to dryness. Prolonged heating at 100° C., or at a higher temperature, renders some of the zirconium unsoluble.

Where much iron is present it is advisable to remove it before trying to separate silica.

The trace of silica was removed by filtration and zirconia precipitated by ammonium hydrate from the clear solution.

When washed, dried, and ignited the zirconium hydrate left a flinty, semi-transparent, slightly yellow mass which became a white powder when pulverized in an agate mortar. It was found best to precipitate the hydrate from a cold solution, since it then dissolved readily in acids. Pure sulphite yields zirconia directly by ignition. To separate the zirconia from all elements of the same group the final precipitation may be accomplished by hydrogen peroxide instead of ammonium hydrate.

Hydrogen peroxide is now commercially available, and, if strong, produces a precipitate of zirconium peroxide, Zr_2O_5, in a solution of either chloride or sulphate.

Processes requiring the use of platinum vessels for fusion were discarded because of their limited size and the bulkiness of the fusion mixtures. This was the case with potassium fluoride, the carbonates of the alkalies, and calcium carbonate with ammonium chloride. The latter mixture was found to resolve the silicate most thoroughly, and to be well adapted for analytical purposes. The process could be conducted in an iron crucible without seriously contaminating the residue with iron. The crucible could only be used twice, however.

Fusion with acid potassium sulphate converts zircon into a basic sulphate and separates iron and silica; but the basic sulphate must be fused with sodium hydrate to render it soluble. It is more convenient to fuse directly with sodium hydrate and separate iron by sulphurous acid and boiling.

While the process above outlined is not intended to replace those given for analytical research, it requires less material, less skill to conduct it, less time, less costly apparatus, and less expensive chemicals where zirconia is to be prepared in quantity than any we have found described or have experimented with.

He Blew it Out.

The *Sanitary Plumber* says it seems rather singular that after illuminating gas has been so long in use there should still be people who know nothing of its management or dangers. There are such people, however, and there will continue to be until education is still more general than it now is.

Some ten days ago a German living at New Windsor, N. Y., went to Newburg and took a room at a hotel. Before retiring he turned the gas down a little, and then blew out the flame. Next morning the guest was found unconscious, his room having been tightly closed and the atmosphere charged

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nat the de-

leather. If tarnished brass be rubbed over with a solution of ox[illegible] the tarnish is soon removed, and the surface left bright. The acid must be

ers by compelling them to sign an agreement that they will belong to no league, scheme or clique, or any organization whatever.

"*Resolved*, That we protest against the ignoble and tyrannical action of the said W. L. Scott, and hereby call upon him to at once cease boycotting men who are simply trying to better their condition by means of organization.

"*Resolved*, That a copy of these resolutions be forwarded to Mr. W. L. Scott."

From the evident pains taken, through newspaper articles and Associated Press despatches, in circulating misstatements of a like tenor as the above resolutions, I conclude they are presumably from the same source; and although I do not see clearly what concern the relations of the Youghiogheny River Coal Company are to you, or the body you advise being Secretary of, yet as your communication is the only avowed expression from any source so far received by me, I avail myself of the opportunity offered by it to make a general reply.

This is best done, as well to your as to all other misstatements, by giving a history of the actions of the miners at Scott Haven, and also of the company since the first suspension of work.

During January, 1886, a self-appointed meeting of miners and operators met at Columbus, O., and agreed for themselves to pay and receive from and after May 1st following, certain prices for labor, the chief one being 71 cents for each net ton of clean coal mined. Neither the Youghiogheny River Coal Company, nor, as I am informed, any of its miners then working, attended the meeting or were parties to its conclusions. Nor were the company's largest competitors, and whose mines adjoin those of my company, the Penn and Westmoreland Gas Coal companies, or their men, parties to that agreement.

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Shortly after the meeting, the Penn and Westmoreland companies advanced their mining price to 55 cents per net ton over a ¾-inch screen which was accepted by their miners for a short period only, all soon after joining in a demand for a further advance to 60 cents per net ton. This demand being refused, led on to a prolonged strike, beginning in February and lasting until June.

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The first hostile act was therefore from and by the miners at Scott Haven, who without just cause refused to work themselves, or to permit others to do so.

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The granular precipitate of zirconium sulphite thus obtained was washed with dilute sulphurous acid water, at first by decantation, then on a filter.

The sulphite was white and granular, and not like that obtained when a solution of the chloride is precipitated by the same reagent. Unless a chloride solution is largely diluted the sulphite precipitated on boiling is gelatinous and utterly unmanageable.

It has been found objectionable to use sodium sulphite or hyposulphite on account of the retention of sodium by the precipitate. When much ferric chloride is present, as will be the case when the fusion is made in an iron dish, then the hydrochloric acid set free through its conversion into ferrous salt adds another source of trouble. Ammonium hydrate may be added in small quantities at a time to neutralize the free acid; but since the zirconium is thoroughly dissolved and separated from iron by sulphurous acid alone, after boiling, there is no necessity for converting the residue left after fusion successively into chloride and sulphite.

To free the sulphite from any traces of silica it was dissolved in hydrochloric acid, and the solution evaporated on a water bath to dryness. Prolonged heating at 100° C., or at a higher temperature, renders some of the zirconium unsoluble.

Where much iron is present it is advisable to remove it before trying to separate silica.

The trace of silica was removed by filtration and zirconia precipitated by ammonium hydrate from the clear solution.

When washed, dried, and ignited the zirconium hydrate left a flinty, semi-transparent, slightly yellow mass which became a white powder when pulverized in an agate mortar. It was found best to precipitate the hydrate from a cold solution, since it then dissolved readily in acids. Pure sulphite yields zirconia directly by ignition. To separate the zirconia from all elements of the same group the final precipitation may be accomplished by hydrogen peroxide instead of ammonium hydrate.

Hydrogen peroxide is now commercially available, and, if strong, produces a precipitate of zirconium peroxide, Zr_2O_5, in a solution of either chloride or sulphate.

Processes requiring the use of platinum vessels for fusion were discarded because of their limited size and the bulkiness of the fusion mixtures. This was the case with potassium fluoride, the carbonates of the alkalies, and calcium carbonate with ammonium chloride. The latter mixture was found to resolve the silicate most thoroughly, and to be well adapted for analytical purposes. The process could be conducted in an iron crucible without seriously contaminating the residue with iron. The crucible could only be used twice, however.

Fusion with acid potassium sulphate converts zircon into a basic sulphate and separates iron and silica; but the basic sulphate must be fused with sodium hydrate to render it soluble. It is more convenient to fuse directly with sodium hydrate and separate iron by sulphurous acid and boiling.

While the process above outlined is not intended to replace those given for analytical research, it requires less material, less skill to conduct it, less time, less costly apparatus, and less expensive chemicals where zirconia is to be prepared in quantity than any we have found described or have experimented with.

He Blew it Out.

The *Sanitary Plumber* says it seems rather singular that after illuminating gas has been so long in use there should still be people who know nothing of its management or dangers. There are such people, however, and there will continue to be until education is still more general than it now is.

Some ten days ago a German living at New Windsor, N. Y., went to Newburg and took a room at a hotel. Before retiring he turned the gas down a little, and then blew out the flame. Next morning the guest was found unconscious, his room having been tightly closed and the atmosphere charged [illegible] poison present had not

been quite large enough, and by noon-time the man was sufficiently restored to sit up. His escape from death is doubtless owing to the fact that he turned the gas partly off before blowing it out. He said that he supposed gas should be blown out the same as a candle or a lamp would be.

This case brings again to attention two important matters—the need of limiting as far as possible the actively poisonous constituent of illuminating gas, and of providing automatic extinguishers to supply deficiencies in caution or knowledge.

The life of those who become exposed to an atmosphere of illuminating gas depends largely upon the amount of carbonic oxide it contains. If made in the old-fashioned way, from coal, the quantity of this substance present is comparatively small, but the impurer "water gas" carries much more, and consequently a fatal dose can be got from the latter much sooner than from the former.

The danger from this source can be avoided only by general public enlightenment, supported by appropriate legislation.

As to automatic protection against open burners, the Patent Office records show that a number of inventors have given the subject attention. Most of their devices are applications of the thermostatic principle—a strip or coil of metal expanded by the heat of the flame contracts when the flame is extinguished, and in so doing closes the burner. One ingenious contrivance depends for its action on the incandescence of a substance suspended in the flame. If the flow of gas is temporarily interrupted, the flame is rekindled by the incandescent body.

We do not know whether any of these inventions have been tried in a way to prove their usefulness in actual practice. However that may be, none are in general use, and the subject is one which well deserves thorough investigation, especially on the part of hotel keepers and others who have the care of large numbers of people who may sometimes be ignorant of the dangers of gas.

As a matter of course, no automatic arrangements, however complete, can be relied on as a perfect substitute for human watchfulness; and the general introduction of a self-closing gas burner would not relieve the householder of the duty of looking after leaks. It could only be counted as an aid in avoiding danger; otherwise risks might be sometimes increased from too great dependence on mechanical protection.

As a special educational measure all hotels and other like places where gas is used for lighting should be provided with printed instructions posted near the fixtures, by which the way of treating gas would be made so plain that scarcely anyone who could read would be liable to make a mistake.

The Carriage of Petroleum in Bulk on Over-Sea Voyages.

[The American gas maker's most pronounced competitor—kerosene—is obtaining a firm foothold in Europe, and our English brethren are watching its progress in their domain with keen eyes. *Engineering*, in the issue of that paper bearing date of July 30th, devotes considerable space to a recapitulation of the efforts made by shipbuilders and owners to solve the problem of cheap transportation of both crude and refined oil over lengthy ocean voyages. The article in question possesses much to interest an American reader, and we herewith reproduce it.]

Although the Institution of Naval Architects was established so long ago as 1860, only once prior to the present year has that body followed the example of kindred associations by holding a meeting elsewhere than in London. That was in the autumn of 1877, when a highly successful gathering took place at Glasgow, the chief center of the shipbuilding industry. The opportunity afforded by the opening of the Exhibition at Liverpool this year has been appropriately taken advantage of by the Council of the Institution, and very successful meetings, which terminate to-day, have been held at that port during the present week. Owing to the fact that the Local Reception Committee had arranged for a large number of excursions to places of interest in the neighborhood of Liverpool, the number of papers read at the meetings has been more restricted than usual, there being but five in all, but this deficiency in number has been fully compensated for by the value of the papers read. One of the most important, and certainly the most opportune, was the paper, "On the Carriage of Petroleum in Bulk on Over-Sea Voyages," read on the opening day by Mr. B. Martell, Chief Surveyor of Lloyd's Register, who drew attention to the great want of economy attending the present method of carrying petroleum, as well as to the almost entire absence of British enterprise in connection with the industry.

Few questions have agitated the shipping world so much as that of the carriage of petroleum in bulk during the last six months. This interest has been excited by more causes than one. The account of the Russian oil wells and of their productiveness, of their extent and capability of almost unlimited development, as well as of the method by which the oil is carried in steamers from Baku to the mouth of the Volga, given in this journal by Mr. C. Marvin, and also in his published work on the same subject, has excited [illegible] interest [illegible]

the shipping now lying idle on their hands, or in many cases being worked at a loss, that would not otherwise have arisen. In addition to this, two sailing vessels, one German and the other American, have been quite recently adapted for the conveyance of refined oil in bulk from the United States to Europe, and have made their voyages across the Atlantic in safety, delivering their cargoes in excellent condition. These two vessels are provided with appliances for satisfactorily keeping the oil under control, and there is no doubt in the minds of those most competent to judge that the problem of the safe carrying of petroleum on over-sea voyages in its main features has been solved.

The trade in petroleum, or rather kerosene, which is refined petroleum, between the United States and European and Asiatic countries, as well as that between Baku and certain European ports, has grown very rapidly during the past ten years. Last year alone 1,531,000 tons were shipped from America, and about 350,000 tons from Baku. But, strangely enough, British shipowners have, as a rule, ignored this important branch of the carrying trade, which has been conducted principally by Norwegian, German and American vessels. Mr. Martell gives the reasons for this lack of competition on the part of British shipowners. The oil which is shipped to Europe generally in barrels, and to Asia and Australasia in cases containing two tins of five American gallons each, cannot be carried on board ship without a certain amount of leakage. It is a property of petroleum common to some other liquids, that it is practically impossible to confine it in any vessel having seams or joints, no matter how close and tight they may be made. It finds its way readily through joints that are thoroughly water-tight, and although by good and careful workmanship the amount of leakage may be reduced to very small proportions, it cannot, even in ironwork, be wholly avoided. Great care is taken in the manufacture and preparation of casks to reduce leakage to a minimum, but notwithstanding these precautions, the loss amounts in some instances to as much as 2 per cent. of the total weight. The oil so wasted gives off such a disagreeable odor, and permeates the woodwork of the hulls of the vessels to such an extent as to render those engaged in the trade unfit, for a time at least, to carry dry and perishable goods. As a consequence vessels once in the trade continue, as a rule, exclusively in it, and they either make the return voyage to America in ballast, or carry returned petroleum casks, or cargoes such as iron or steel rails, which are not affected by the odor of petroleum.

The British shipowner, so long as he was able to secure remunerative freights for cargoes to which these disadvantages were not attached held aloof from the oil trade, which thus became monopolized by an inferior class of foreign wooden sailing vessels. But the hard times through which the shipping trade is now passing, and the difficulty of obtaining freights which enable them to be employed without loss, to say nothing of profit, has led British owners to turn their attention more closely to the question of the carriage of petroleum, and to inquire whether it is not possible to do with profit and with safety on over-sea voyages that which has been done with safety for nearly ten years on the Caspian—viz., to dispense with casks altogether, and to carry the oil in bulk.

The method of carrying oil which naturally suggests itself as being the simplest, especially in wooden vessels, is by means of large iron tanks ranged in the hold and 'tween decks, and it is of interest to remark that two vessels, one iron and the other composite, have been quite recently fitted in this way. This plan, which was the first adopted, was brought into use in the Atlantic trade so long ago as 1869, and was employed in a Belgian vessel for two or three years until she caught fire and was burnt. But the cost of the iron tanks was very great, and this led to the attempt to dispense with them, and to carry the oil in compartments of the vessels. With this view some foreign wood vessels were fitted for the purpose with transverse bulkheads separating the hold into convenient lengths, and with two thicknesses of wood ceiling, having between them a layer of either felt or cement. The oil was carried in these vessels below the hold beams, with casks in the 'tween decks in the usual way. But they were not successful, and disappeared one after another, and at the present time we believe that only one such vessel is engaged in the trade.

With our present knowledge of the appliances found necessary for the safe carrying of petroleum on the Caspian, and of the elaborate precautions required to be taken, there is no room for wonder that those vessels which were without any such appliances were lost. We have alluded to the fact that leakage takes place from petroleum in barrels which is estimated to amount in some cases to as much as 2 per cent. of the total cargo. Apart from the inconvenience and the loss of oil which such leakage entails, the safety of the vessel is not thereby seriously imperilled. But with oil in bulk the case is different. Leakage must go on. Some of the oil finds its way between the frames and through the seams of the planking, and becomes diffused through the sea water which is not able to enter and take its place. As a consequence the compartment becomes only partially filled, and without appliances for supplying the loss due to leakage, dangerous results may [illegible] a partially filled compartment must be greatly agitated by

such severe weather as is experienced in the North Atlantic during the winter months, and this causes the vessel to strain and lose a larger quantity of the oil. Any fall in the level of the oil, too, if it takes place over an appreciable area, gives rise to a new danger, because the vessel's stability becomes reduced, with the result that she lists over to a considerable angle before reaching a position of equilibrium. It is obvious, therefore, that for the safe carriage of petroleum in bulk, means should be taken, especially in wood vessels, to supply any loss due to leakage.

Another point of great importance, which was altogether overlooked by those who first carried oil in bulk across the Atlantic, is the variation in the volume of petroleum with change in the temperature. American refined oil has on the average a specific gravity of 0.80 at a temperature of 60° F., and with an increase of temperature to 70° the specific gravity falls to 0.796. This is equivalent to an increase in volume of four gallons in eight hundred for an increase of 10° in temperature, or about twice as great an expansion as occurs in water through an equal increase of temperature. Hence, if tanks be filled at the commencement of a voyage, provision should be made for the expansion of the oil, which must follow upon getting into a warmer climate. None of these precautions were taken in the wooden vessels engaged in carrying oil in bulk across the Atlantic.

It should, however, not be inferred from the loss of so many wooden vessels engaged in carrying oil in bulk that they are less suited than iron vessels for this trade if properly fitted. Such an assumption is indeed disproved by the fact that the wooden barque Crusader, specially fitted last year for the oil trade, has already made three very successful voyages from New York to London, the cargo having been at all times under perfect control. The Crusader can, however, only be considered to be a working model intended to illustrate the plan upon which she is fitted, and which is patented by the owner. The cylinders in which the oil is carried in this vessel are of such small size, and are so uneconomically arranged, that she is able to carry but very little more oil than with a full cargo of barrels.

Little is known regarding the details of the earlier steamers constructed for the oil trade on the Caspian, but the later ones are supplied with all the appliances which experience has shown to be necessary for the safe carriage of oil in bulk. They are built in Sweden, and are cut in two amidships to enable them to be floated through the Russian canals to the Volga, and thence to the Caspian.

As a result of the present movement in the direction of the carriage of oil in bulk, two steamers, the Gluckaüff, built by Sir W. Armstrong, Mitchell & Co., and the Bakuin, built by Messrs. W. Gray & Co., have been specially designed, the former for the American oil trade, and the latter for the Russian trade from Batoum. The arrangements in these two vessels, as well as in those being built, and in others being altered, have certain features in common. The holds are divided up into several compartments by transverse and longitudinal bulkheads, so that too large a quantity of oil may not be carried in any one tank; each tank is capable of being filled or emptied independently of the others; reserve tanks communicating with the several compartments are provided to supply any waste due to leakage, as well as to hold the excess of oil in the event of expansion taking place; and to each tank is fitted a ventilator through which any gases given off by the oil may escape into the air. They differ, however, more or less in the details of their design. The oil, according to one plan, is carried in tanks built within the hull, pains being taken to prevent it being brought into contact with the skin plating; in another plan the oil extends to the outer plating in both the bottom and sides of the vessel, while in another it extends to the sides but not to the bottom, the top of a cellular bottom forming the base of the oil tanks.

It is impossible in the present state of our knowledge to judge of the relative merits of these several plans. Each method of construction has its advocates; but actual experience at sea can alone demonstrate whether vessels in which the oil is carried next the skin can deliver it without some deterioration in its quality having taken place. In one vessel it is proposed to carry the oil up to the under side of the weather deck. This plan has never, we believe, been adopted in the Caspian trade, and although we are unable to see any great objection to it where suitable precautions are taken to prevent fire in the event of leakage through the seams of the deck plating, such a result may occur in cases where a want of proper care is displayed, and this leads us to remark upon the necessity for moving with due caution in the introduction of novel and untried plans for carrying oil in bulk. Hasty and unconsidered proposals which have not the sanction of experience, may, if put into practice, be productive of calamitous results, and thus check for a time the development of what promises to be an important branch of the carrying trade.

The amount of the gain in the quantity of oil carried under the bulk system as compared with the present plan depends, to some extent, upon the method of construction adopted, but it cannot well be less under some of the plans than 50 per cent. This of itself is a sufficient inducement to cause a revolution in the practice of carrying oil, but when it is added that the depreciation in the value of barrels increases by nearly one halfpenny per gallon the cost of the oil, and that under the bulk system a great saving in the time required for loading and unloading is effected, it is matter for wonder that the revolution now about to take place had not been accomplished many years ago.

Gas Fitter's Rules to be Adhered to at Waukesha, Wisconsin.

The Superintendent in charge of affairs at the gas works now being constructed at Waukesha, Wis., and known under the corporate name of the Waukesha American Gas Company, has promulgated the following rules to be adhered to by the plumbers of that city when piping houses for gas supply:

1. The following table shows the proportionate size and length of tubing allowed to be run:

Size of tubing.	Greatest length allowed.	Greatest number of Openings.
⅜ inch.	20 feet.	2
½ "	70 "	10
1¼ "	100 "	30
2 "	200 "	100
½ "	30 "	3
1 "	90 "	15
1½ "	150 "	60

No ¼-inch pipe must be concealed, and only 6 feet for one opening can be used as risers and drops for bracket lights of unconcealed work.

2. The riser in any building must not be less than 18 inches from the floor for two, three, and ten openings. Two feet six inches for fifteen and thirty openings. Four feet for fifty and one hundred openings.

3. No riser in any building must be less than ¾ of an inch, except where there are but three openings, when ½-inch will be allowed. In buildings with double parlors the drops must be ½-inch, with a set from the main line of pipe of not less than four inches, dropped square, and well secured by gas hooks to the joists, the same to be observed on all cross lines of pipe. Drops and side openings, where nipples are used, must be made secure by lock-nut or solder to prevent them turning inside the plaster, and must be well secured by gas-hooks; and where a coupling or L is used on the drop, then a strap or lock-nut must be soldered to the drop, and fastened to the joists with screws.

4. The rise pipes in all buildings must be placed where the meter and stopcock can be readily got at for the convenience of the consumer to turn off the gas, and for the employes of the company to read the index and put the meter in order when required; and in no case will a meter be set where it will be exposed to damp or frost, or be liable to injury from any cause.

5. Service pipes, when extended from where the company has left them, must in all cases be continued the same size as said service pipe laid by the company up to the meter.

6. In all cases where extensions are made care must be taken to break the pipe where the rule for sizes can be kept, and in no case must extensions be made from small pipe.

7. All openings must he closed with iron caps, and in no case will lead caps be allowed. No split pipe or broken fittings, repaired with cement or lead, will be allowed.

8. All pipes must be examined by the inspector of the company before being concealed, and due notice must be given by the fitter when any pipe is ready for inspection.

9. For churches, theaters or public buildings, where large chandeliers, reflectors, or sun burners are to be used, the pipes must be of sufficient size.

It is the intention of the company strictly to enforce the above rules, and no certificate of inspection will be given when they are not complied with. To avoid trouble architects and builders are requested to allow no bill for gasfitting unless accompanied by a certificate of inspection.

Two Useful Recipes.

Cleansing Brass.—An exchange says that the method of cleansing brass prescribed by the Navy and War Departments of the United States is accounted superior to any of the systems in vogue in foreign countries.

A mixture is made in a stone jar of 1 part common nitric acid and ½ part sulphuric acid. By the side of it are placed a vessel of fresh water and a box of sawdust. The work is dipped in the acid, then put into the water, and, lastly, rubbed with sawdust. This makes the work at once exceedingly brilliant. If the brass has become greasy it is previously dipped in a strong solution of soda and potash in warm water; this cuts the grease, and the acid has free power to act.

Another method is to rub the surface of the metal with sweet oil and rotten stone; clean off with a piece of cotton flannel, and polish with soft leather. If tarnished brass be rubbed over with a solution of oxalic acid, the tarnish is soon removed, and the surface left bright. The acid must be

washed off with water, and the brass rubbed with soft leather and whiting. If brass articles are steeped for a few seconds in a mixture of muriatic acid and alum dissolved in water they receive a golden color.

Articles coated with old lacquer should be boiled in a pan of water with common washing soda; this removes the old lacquer. Then place them for a little time in dead aquafortis; afterwards run them through bright dipping aquafortis. Swill off all the acid in clean water, and brighten any relieved parts with a steel burnisher; cleanse with clean water, and dry the work in beech sawdust. Then put the work on a heated stone, and apply pale lacquer with a brush; the work will be burnt if heated too rapidly or too highly.

A simple and easy way is to make a strong lye with rock alum, in the proportion of 1 oz. to a pint of boiling water; wash the work in this, and polish with dry tripoli.

When only part of a piece of brass work requires cleaning, coat that part with acid by means of a piece of rag; as soon as it turns light yellow rub it dry, and the brass will generally be clean; if not satisfactory, repeat the process. A second way is to mix oxalic acid and whiting and apply wet with a brush to the parts requiring cleaning; when they have dried brush again with a soft plate brush and dry whiting.

Cleaning Gas Chandeliers.—It is seldom that gas chandeliers are gilt; they are nearly always lacquered with yellow lacquer and burnished. But whether gilt or lacquered, they may be cleaned thus. Take the chandelier to pieces, and boil the pieces for several minutes in a strong lye. Then brush them over with a soft brush. Next pass them through a strong solution of cyanide of potassium, which is a deadly poison. Then wash the pieces thoroughly in a large vessel of boiling water. Dry them in clean sawdust, wipe them bright with a wash leather, and where required relacquer. Finally, refit the parts together.

Natural Gas in Ohio Potteries.

An exchange says that the first discovery of natural gas in the neighborhood of East Liverpool, Ohio, which locality is noted for its manufacture of pottery, was in 1860, while drilling for oil. Gas was found at several places in the vicinity about the same time. At Jethro, a locality within the town limits of East Liverpool, two gas wells were struck; one was struck on Ball's Island, in the Ohio river opposite the east end of the town, one on McKinnon farm, east of the Cleveland railroad depot, one on the Virginia shore, directly across the river from this depot, and several others of but little note. The gas was struck at 400 or 600 feet from the surface.

The Jethro well produced strong salt water in abundance, which was thrown out in large volume by the pressure of the gas. A short time after the well was struck, evaporating pans were put up and the gas utilized in evaporating the salt water, which was also thrown out of the well by its pressure. Shortly after this utilization of the gas at the Jethro well, the gas from another well, at Little Beaver Bridge, four miles east of East Liverpool, and near the Pennsylvania State line, was utilized in the same way. It appears from this, therefore, that as early as 1860 natural gas was used in evaporating salt in the East Liverpool district.

In October, 1873, Mr. Homer Laughlin sunk a well at his pottery within the town limits, this being the first well bored especially for natural gas. Its product was also the first gas utilized in the East Liverpool region for fuel and light, with the exception of the gas from the two wells above mentioned, which was utilized in salt manufacture. Two years later, or in 1875, other parties in East Liverpool bored wells, the gas from which was also used for fuel and light.

These wells, however, have never been large producers, and have only furnished gas for light and fuel for small fires. Some years ago, at a time when a number of wells had been freshly bored, the gas from them was used in firing a very few kilns of ware—a large number of the best wells, owned by different people, being coupled or connected together.

The supplies from these old wells have been gradually falling off, until at present the entire product will only furnish gas sufficient for light and fuel for a few stoves and house fires. Recently, however, a very productive gas territory has been opened, some six miles south of East Liverpool, in West Virginia, the gas from which has just been piped to this town, and is being used in the potteries for all purposes for fuel and light. At the present time this is the only fuel used in these establishments.

A Lubricant for Brass.

Lard and grease have, as is well known, a corrosive action on brass and copper, and this is a drawback to their use as a lubricant for these materials. Mr. H. S. Madan points out that while both melted india-rubber and vaseline are without corrosive action on brass, each alone has a disadvantage. Thus melted india-rubber is too glutinous, and, in course of time, hardens. Vaseline never hardens, but it is deficient in tenacity and adhesiveness. A mixture of both substances is therefore recommended by Mr. Madan, consisting of one part by weight of melted india-rubber and two parts of vaseline. The rubber should be pure, not vulcanized, and cut into shreds, then melted at the lowest possible temperature in an iron cup, while being pressed down against the hot cup and stirred into a uniform glutinous mass. The vaseline of the common thick, brown sort should be added to the india-rubber and the whole thoroughly stirred and blended together.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Sale Confirmed.—In our issue of July 16 it was stated that Mr. Hugh Reilly, through proper legal process, on June 30 sold to A. M. Brady the entire plant of the Peoples Gas Light Company, of Albany, N. Y. The sale was made in consequence of a judicial decree in foreclosure proceedings, and the sum of $50,000 was realized from the property. The final act in the matter was played on date of August 20, when Justice Learned confirmed the final report handed in by referee Reilly. The report and accounting show that the principal and interest due on the bonds, under which the foreclosure took place, amounted to $436,273. Deducting expenses of conducting the suit, the balance applicable to the settlement of the bondholders' claims was $45,750. Mr. Brady, the nominal purchaser, represented those holding $403,982 of the claims; Mr. Wm. Astor figured as a judgment creditor in the sum of $12,331; Mr. Matthew Hale (as trustee) represented $5,154; and the balance was distributed amongst seven other creditors. In the final accounting Mr. Brady received $42,461; Mr. Astor, $1,296; the unnamed seven, of course, absorbing $1,993. So ends the Peoples Gas Light Company; and it might be fairly said that the defunct corporation never subserved a useful purpose since the hour it was chartered.

A Leaf from the History of the Springfield (Ohio) Gas Light Company.—Those who visited Springfield last March, on the occasion of the Second Annual Meeting of the Ohio Gas Light Association, need not be told that Springfield's gas suppliers are to be included in the list of those who have but scant time for resting on their oars; and it is unnecessary to add that General Bushnell and his aides appear to be perfectly satisfied with their unrestful condition. But the status of the pioneer Springfield gas men seems to have been as listless as the present is bustling, in testimony whereof we submit the following particulars, which are in every sense authentic, and which in fact may be directly traced to the genial gentleman now in charge of the old Springfield Gas Light and Coke Company's fortunes. On March 8, 1849, or about a year before the city of Springfield was incorporated, certain gentlemen received from the State authority to form a company, to be known as the Springfield Gas Light and Coke Company, which, to use the words of the permission, was to be "a body politic and corporate, with perpetual succession, to manufacture gas from any or all of the substances, or a combination thereof, from which gas is usually obtained." We believe it was further stipulated originally that the capital stock of the company was not to exceed $30,000. Of course it was easy to pr ceed thus far; but the real "tug of war" came when it was attempted to raise the requisite funds with which to carry on the purposes for which the enterprise was founded. The place was in its early infancy, and weight of years could not then be claimed for the gas business. However, eight months of persistent financiering resulted in the accumulation of sufficient capital to warrant a start—and a most modest one it was. On October 3, 1849, a contract was made between the company and Mr. E. Gwyn, and under its terms the builder erected a structure 22 feet by 30 feet, and 13 feet high, in which was placed one bench of three small iron retorts. The chimney consisted of an iron smokestack that rejoiced in an altitude of 25 feet. Over a tank 20 feet in diameter and 9 feet deep was suspended a *zinc* gasholder. The conduit system consisted of a total length of 1,500 feet of cast iron mains, one-third of same having a diameter of 3 inches, while the remaining two-thirds were but 2 inches in orifice. The plant was finished on February 25, 1850, and, owing to the nature of the material employed in the gas manufacturing process, the concern was called the "Grease Gas Works." The builder (Mr. Gwyn) leased the works from the stockholders for a period of three years, and the agreed upon rental was his guarantee that the owners should receive 6 per cent. per annum on their shareholdings. Mr. Gwyn put the selling rate at $4 per thousand cubic feet, and met with but little encouragement from the residents; and in September, 1851, the original venture "went up in smoke," or, rather, the grease gas works were destroyed by fire. Nothing daunted, the owners rebuilt the plant on about the old style and leased the enterprise to the city, and the latter remained in control until July 1, 1852. Presumably tiring of grease ventures, a lease of the establishment was now made to Mr. J. D. Foster, who agreed to manufacture coal gas, but was restricted in the charge that he might make for same to a rate not to exceed $3.50 per thousand cubic feet. Mr. Foster soon tired of the gas business, for on December 11, 1852, we note that he assigned his lease to Mr. J. G. Miller, who immediately advanced the selling rate to $4, and followed this move up (on January 5, 1853) by putting the schedule charge at $6. How

long the latter rate was adhered to we are unable to say; but Mr. Miller operated the works until August, 1857, when Mr. Kinsman—a brother of Mr. N. Kinsman, the present Superintendent—appeared on the scene. The newcomer met with very fair success, and remained in possession for many years. In 1871 the old works, which had been in operation for 21 years, were abandoned, and a new six-inch plant was erected on North Market street. This latter was completed on November 10, 1871; and now Springfield was taking rapid strides in the matter of increased business importance. Large manufacturing interests centered in the place, and Mr. Kinsman had, even with the new plant in thorough working order, a lively time of it in meeting the demand for gas. In July, 1881, he wearied of the struggle, and the works came under the control of Gen. Bushnell and his associates. The General, after reconnoitering the situation, decided to settle the question at once, which he did (and successfully) by the erection of the existing 10-inch plant, which was put in operation in November of 1882. The works are capable of supplying 250,000 cubic feet of gas per day, and are in decidedly queer contrast with those which contained the bed of iron threes in '49. To make the comparison still more odious, we may note that the 1,500 feet of '49 mains had expanded to over 35 miles in '85; the "occasional" public lights of the early days glimmer but sadly in the effulgence shed by the 540 of the present; and we opine that Mr. Foster, who, in 1852, gave up his lease in disgust, would have held on with a firm grip were he blessed with a roll of consumers much fewer in number than the 1,200 or over whose names now adorn the ledgers of Gen. Bushnell's Company. In conclusion we may add that the Springfield Company's present sendout closely approximates to 140,000 cu. ft. per diem—of which not a foot is "greasy"—and which is disposed of at rates that look very small when written down side by side with those in vogue during the management of Mr. Miller, in 1853.

Westinghouse Engines to Drive the Exhausters.—The exhausters at the new plant of the Municipal Gas Light Company, of Albany, N. Y., will be kept in duty by two 25-horse power Westinghouse engines. We might further add that the Westinghouse engines are to be found in operation in almost every State and Territory of the Union—the only exceptions are furnished by Nevada and Indian Territory.

More about the Quality of Omaha (Neb.) Gas.—Perhaps the Omaha *Bee* is wrong about the matter; and perhaps it is right. At any rate, in the issue of that paper bearing date of August 19th, we find it editorially mentioned that "City Gas Inspector Gilbert reports the gas company is failing to comply with its contract with the city. An inspection of 71 gas burners showed a deficiency, in 55, of 20 per cent., or a loss of light amounting to $9 per year on each lamp." The Omaha Gas Manufacturing Company manages to keep itself prominently before the "eyes and ears of the public," if not in the matter of supplying a good lighting agent, at least in the way of being told how unsatisfactorily it caters to the wants of the gas consumers.

Headquarters in New York City for the Crystal Carbon Light.—In response to numerous inquiries made to us regarding the headquarters in this city for displaying the new crystal carbon light, we may reply that it may be seen in operation at the office of the Mica Roofing Company, No. 73 Maiden Lane. Otis K. Dimock, of 77 Maiden Lane, is the properly accredited agent for the sale of the crystal carbon lamp in the metropolis. Those in charge of the home establishment—the main office is at 1618 Chestnut street, Philadelphia, Pa.—report that great success has attended their efforts in placing the lamp upon the market. This state of affairs shows how eager the gas men are to take hold of anything calculated to give their consumers an improved lighting service.

Captain White Still Moves with the Procession.—The St. Paul (Minn.) gas men, headed by "Cap." White, have made good their word to the gas consumers of that place. They promised to enlarge their manufacturing facilities as frequently as the demand upon the plant reached a certain point, to the end that the consumers, present and prospective, would be assured of a plentiful supply of the light of the present. Such promises, owing to the rapidity with which the metropolis of the Northwest spreads, mean the expenditure of much money, and a display of no little engineering talent; but money and skill are at the free command of the St. Paul company's managers, and it is needless to add the money is expended and the skill is invoked. This liberal policy explains the wonderful success which has attended their administration, and the certainty of its continuance is the best index to the future prosperity of the company's operations. The extensions, mention of which was made some weeks ago in these columns, are in a forward state, and will be completed in ample time for the winter's work. Among the latest orders given we notice that Connelly & Co. are on the list to furnish the St. Paul plant with one of their 16-inch automatic governors. The same firm will also supply a 3,000-bushel lot of iron sponge.

Sweden is Manufacturing Oil from Wood.—It is reported that a new industry, which promises shortly to become a decidedly important one, is being developed in Sweden—the thrift and carefulness of whose inhabitants all must acknowledge. The industry is nothing less than the manufacturing of an oil for illuminating purposes from the stumps and roots that remain when a forest has been stripped of its standing timber. The stumps, etc., are subjected to a process of dry distillation, and besides the oil many other products, such as turpentine, creosote, acetic acid, wood charcoal, tar oils, etc., are obtained. The oil cannot be used in the ordinary form of lamps, since it gives off an excess of smoke during combustion; and in order to overcome that objection a special form of lamp has been devised. It can, however, when properly diluted with benzine, be satisfactorily employed in the common style of benzine lamp. The species of stumps which afford the largest quantity of oil are, of course, those of the pine and fir, although almost all varieties of forest growth may be employed. It is said that some forty establishments are now engaged in Sweden in this enterprise. The source from whence we derive our information omitted any reference as to the cost of the oil compared with that usually charged in Sweden for refined petroleum.

To Increase the Capital Stock.—A majority of the trustees of the Municipal Electric Light Company, of Brooklyn, N. Y., recently ordered that a meeting of the stockholders be held at the office of the Company, on date of September 1st, for the purpose of sanctioning an increase in the capital stock. The present capital amount is one-quarter million dollars, and it is proposed to make an even half million out of it. The Municipal Company, as far as we can learn, does not require any money for the extension of its plant, etc., and in fact it was generally supposed that its present capital burden was rather more than it could conveniently carry. In fact it seems possible that the proposed capital increase is simply made with the object of placing the extra shares where they will "do the most good." At any rate one thing is certain, and the certainty is that the other electric lighting concern over in Brooklyn never had much luck in the way of obtaining public lighting contracts until its capital stock was doubled, which fortuitous event was followed by the appearance of the names of several prominent Brooklyn politicians in its directorate. When the politicians took hold a great change became apparent, and no trouble was experienced in the matter of advancing into favor with the powers that be. Street after street was turned over to the electricians, and even the bleak hill tops of the Ninth Ward, together with the purlieus of Red Hook Point, rejoiced in the glare of the arc. If the inside history of the electric deal in the City of Churches could be made into an open book, the pages thereof would carry interesting reading, possibly equaling in piquancy some of the records of the Lamps and Gas Committee made at a time when Messrs. Furey and Fowler were not unknown to the taxpayers of Brooklyn. It is pretty safe to venture the prediction, should the present stockholders vote to double the capital of the Municipal Company, that they will speedily secure a much greater share of municipal favor than they now enjoy.

Still Forming Natural Gas Companies.—Documents incorporating the Cincinnati (Ohio) Natural Gas and Fuel Company were filed with the Clerk of Hamilton County on August 18. Messrs. L. R. Kick, L. A. Ault, G. H. Nesbitt, A. H. Honshell, T. R. Wiborg, L. D. Ault, G. A. Bowen, W. C. Shives, and F. C. Percival are named as incorporators. Appreciating the "true value" of their undertaking, the capital of the concern is modestly placed at $20,000,000. As set forth, the object of the company "is to acquire lands, leases, and mining rights for natural gas and petroleum oil in Kentucky and West Virginia, and to construct and bore wells for the production of natural gas and petroleum."

Patent No. 347,693.—Mr. J. M. Critchlow, of Beaver Falls, Pa., has taken out letters patent on a "process of decomposing and carburetting natural gas." We may have something more to say about the process in a subsequent issue.

Changed their Offices.—The proprietors of the National Gas Light and Fuel Company, whose executive offices were formerly located at 162 Washington street, Chicago, Ill., have leased rooms in the new Insurance Exchange Building, No. 218 La Salle street, same city. The change was made on August 1st.

A Word from Lynn, Mass.—Prichard, of Lynn, didn't enjoy a very lengthy vacation this summer, not because he is opposed to such pleasant relaxations, but simply because he had to keep an eye on the improvements that were being made on the Lynn gas plant. We understand that he has ordered a 10-inch Connelly automatic governor. His slumbers during the long nights of the coming winter will be none the less peaceful on that account.

A Gas Company Changes Hands.—The gas works at Peru, Ind., have passed into the control of the American Gas Company, of Phila., Pa., and will hereafter be known as the Peru American Gas Company. The capital stock of the reorganized enterprise is placed at $60,000, and it is

proposed to operate an electric lighting plant in connection with the gas supply.

SOMETHING FROM AUGUSTA, GA.—Mr. G. S. Hookey, Superintendent of the Gas Light Company of Augusta, writes us that a contract has just been perfected between the city and the Company, under the terms of which the owners of the latter agree to furnish gas to the public lamps in consideration of the receipt from the authorities of the sum of $12.50 per lamp per annum. This, of course, implies that a moon table system is to prevail. The contract is to extend over a period of five years from the termination of the present agreement, and the latter will expire about a twelvemonth from now. The Company has announced to its patrons that from and after the 1st inst. the price of gas would be reduced to $2 per thousand cubic feet. Certain capitalists have made strenuous efforts to secure control of the Augusta Company, but Messrs. Barnes and Hookey do not seem disposed to part with a property which is of as much value to them as it is to anybody else. And they are right.

STREET LIGHTING AT COHOES, N. Y.—The municipal authorities of Cohoes seem disposed to try arc lighting on the streets under their control, but it is far from certain, judging from the way in which the matter is discussed, that any immediate affirmative action will be taken. At the last meeting of the Common Council the Cohoes Gas Light Company petitioned for the privilege of establishing an electric plant, and agreed to be in readiness to furnish light within ninety days from date of receiving the permission. The petition was tabled. At the same meeting of Council a representative of the Pope Electric Light Company asked the privilege of erecting poles on which to string wires, and that petition was also relegated to the table. The Cohoes rulers will not lose anything by waiting.

POUGHKEEPSIE (N. Y.) NOT SATISFIED.—The people of Poughkeepsie are far from pleased at the manner in which the electricians are lighting the streets of that city. Dark spaces are plentiful, and the contractors assert that the shade trees are responsible for the gloom. The total number of arcs in duty, up to date of August 20th, was 188, and the probability is the number will have to be increased to over 200 before anything like an adequate lighting service is rendered. Under the contract in force we believe the electric promoters agreed to light the city thoroughly for the gross sum of $18,000 per annum, and if they are obliged to maintain over 200 arcs to perform the stipulated illuminating service, we fail to see how any profit is to be made on the work. In fact it would seem as if the Poughkeepsie electricians' cake contained a large and unpalatable percentage of dough.

CHEAPER GAS FOR SCRANTON, PA.—On April first, of current year, the managers of the Scranton and Hyde Park Gas Company lowered their selling rate, and also promised, if their consumers would, by a liberal use of gas, increase the sendout to a certain figure, that other reductions would follow in short order. True to the promise we now find them to be, for Secretary G. B. Hand, on date of August 24th, was authorized to announce that from and after October 1st the following schedule would take effect:

Gross charge.....	$1.50	per thousand cu. ft.	
Less 10 per cent. on monthly accounts less than $10, or.....	1.35	"	"
Less 15 per cent. on monthly accounts between $10 and $25, or..	1.27½	"	"
Less 20 per cent. on monthly accounts $25 and over, or.....	1.20	"	"

The gross charge will be exacted in all instances when the bills are not settled within 20 days from date of presentation. The Scranton gas folks are to be congratulated upon the faithfulness with which they have adhered to the policy inaugurated years ago, and they have had no reason to complain of the results achieved.

AN ADDITION TO THE FIRM NAME.—Mr. C. H. Sprague, of No. 70 Kilby street, Boston, Mass., who is so well known to the gas men of the New England States, has admitted his son (Mr. P. W. Sprague) to partnership. The new firm will be known by the title of C. H. Sprague & Son, and they will, as heretofore, act as agents for the sale, in the New England States, of the fireclay goods manufactured by Jas. Gardner, Jr., of Pittsburgh, Pa.

WHAT IT DOES COST.—The proprietors of a "pink daily evening" newspaper, published in Cincinnati, Ohio—it is called the *Telegram*—have become impressed with an idea that they know all about gas makers and gas making. These "formers of public opinion" are particularly well posted as to the cost and quality of the product sent out by General Hickenlooper's Company, and, noting their familiarity with every department of the gas maker's craft, it is rather curious they do not sever their connection with newspaperdom and make a start in the gas business either on individual or joint account. Perhaps that is what the "pink 'uns" are after—in the shape of securing admittance on the ground floor, by way of "stock and bonds alley," to an interest in a company that would divide Cincinnati's gas supply. The newspaper owners have rehashed all the claptrap concerning nominal reductions in gas charges, which were invariably followed by the presentation to consumers of larger bills; the changes on pressure were rung; in fact, all the beauties of the Sherwood system were illustrated in various issues of the "pink paper." One "great hit" was made when the "editors" declared that Superintendent R. P. Green, of the Ohio Penitentiary Gas Works, located at Columbus, Ohio, was able to make a good article of coal gas in that institution at a cost not to exceed 23 cents per thousand cubic feet. Now, Supt. Green perhaps remembers that portion of the proceedings of the last annual meeting of the Ohio Gas Light Association, when the matter of the cost of the Penitentiary gas was discussed, and others will also remember what Mr. Green then said. But for fear that the "pink 'un" is not posted as to what took place on that occasion, we would respectfully refer him to the figures contained in Supt. Green's last annual report, covering the operations of the gas plant managed by him during 1885. A survey of the figures presented points to the fact that rating the convict labor employed in the gas works as worth 70 cents per man per day, the Penitentiary gas was manufactured at a net cost of not less than 42½ cents per thousand cubic feet. If the "pink 'un" could only secure the services of convict compositors and pressmen the expenses of getting out the *Telegram* editions might be so greatly reduced that its proprietors could see a way clear to furnishing their patrons with an occasional issue printed on white paper.

THE PIPES ARE TO RUN THROUGH THE HOUSES!—The St. Louis (Mo.) *Chronicle*, of date of August 14th, contained the following announcement: "The Missouri Water Gas Company has been incorporated in Belleville, and proposes to furnish gas in St. Louis, at $1 per thousand, by means of gas generators in each block, and pipes running through the houses." The "pink 'un's" attention is respectfully invited to the above. It may afford him a hint of value in connection with the possible ground-floor enterprise.

DESTROYED BY FIRE.—At about 7:30 P.M. on August 16 a fire broke out in the premises occupied as a station by the Brush Electric Illuminating Company at Nos. 204 to 210 Elizabeth street, this city. The loss to the Company was estimated at $125,000. The Company had 45 dynamos in the burned buildings, and the plant was calculated to supply a total of 1,200 lights. It appears, however, that but about 600 lamps were fed from the station at the time of the disaster. And right here it is curious to note Supt. McGrath explains that the small number of lamps in use is to be attributed to the fact that the present is the "dull season." Has it not been generally understood that the summer time furnished the arc purveyors with their golden opportunity? No lengthy interruption occurred in the service to the public lights fed from the Elizabeth street station, a connection having been made at once with the Twenty-fifth street plant. Supt. McGrath thought the fire was due to "friction of battery."

DOUBTING THE CANDLE POWER.—When the electricians secured the contract for lighting the streets of Schenectady, N. Y., it was expressly stipulated that each arc should furnish a 2,000-candle power illumination. Since the inception of the work continual complaint has been made that the light was inadequate, and far poorer than that afforded under the former gas system. The discontent finally reached such a pitch that the lamp committee of Common Council employed a New York city expert to make a test after the plan recently pursued in Denver, Col. The test was made in the latter part of August, but it was not to be made public until the next meeting of the Council. Will our friends in Schenectady kindly advise us as to the findings reached?

COST OF STREET LIGHTING AT EAST LIVERPOOL, OHIO.—The *Crisis* is our authority for stating that the East Liverpool Gas Company receives a grand total of $35 per month for the gas supplied to the public lamps. The lamplighter receives $25 per month for his services. Hence public lighting in East Liverpool costs the ratepayers just $720 per annum.

WILL IT BE INVESTIGATED?—Some lively developments are expected to result from the query now being agitated at Portsmouth, Ohio. It is proposed to investigate the methods pursued by those in authority who foisted an electric plant on the taxpayers.

MR. GILLESPIE'S ESTIMATE.—Mr. T. A. Gillespie, General Superintendent of the Philadelphia Natural Gas Company, is reported as having recently said: "As near as we can ascertain, there are displaced daily 260,000 bushels of coal by the use of natural gas. I think there were from 150,000 to 180,000 bushels of coal consumed each 24 hours in Pittsburgh, Allegheny, and the surrounding towns at the time of the introduction of natural gas in Pittsburgh. In 1883 one or two Pittsburgh mills commenced using the new fuel, and since then the consumption has gradually increased to such a degree that all companies engaged in the business have been kept busy laying pipe to supply the demand, and several thousand dwellings are without this fuel."

ATTENTION is directed to the "pressure cards" from Milwaukee, Wis., illustrated in the advertisement of Messrs. Connelly & Co., on page 149 of this issue.

THE incandescent system of electric lighting has been voted a practical failure by those in charge of the publication of the New York *Daily Times*. Gas once more lights the *Times* building from cellar to garret.

The Market for Gas Securities.

The city gas share market was absolutely without feature during the fortnight, save that illustrated by dullness. Quotations, however, were fairly well maintained, except in the case of Mutual. We note a sale, at auction, of 20 shares Mutual at 108. Despite the weakness in Mutual quotations it seems as if these shares now afford opportunity for profitable investment. Consolidated, at time of writing (noon, Aug. 31), is bid for at 80. The Brooklyn situation is a funny one to say the least; but Williamsburgh, old Brooklyn, and Citizens shares ought to find purchasers at prevailing rates. It is reported that the fall River Gas Works Company, of Fall River, Mass., or at least a controlling interest in the same, has been purchased by New York operators. It is understood that $135 per share was paid for the control, and it is further asserted that the new purchasers stand ready to buy up the entire capital stock at similar figures. No wonder they express such a willingness, for, at the price noted, the securities are simply "dirt cheap." The entire capitalization of the company is but $288,000.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

September 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	79¾	80
Central	440,000	50	—	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	117	120
" New Stock			150	155
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	113	—
Mutual	3,500,000	100	102	103½
" Bonds	1,500,000	1000	104	107
Municipal, Bonds	750,000		—	—
Northern	125,000	50	—	—
" Scrip	108,000			
Yonkers		50	51	55
Richmond Co., S. I.	300,000	50	50	—
" Bonds	40,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	110	—
Citizens	1,200,000	20	65	—
" S. F. Bonds	320,000	1000	—	105
Fulton Municipal	3,000,000	100	150	151
" Bonds	300,000		—	105
Peoples	1,000,000	10	66	—
" Bonds	290,000	—	—	103
" "	250,000	—	—	102
Metropolitan	1,000,000	100	—	85
Nassau	1,000,000	25	110	113
" Ctfs	700,000	1000	—	101
Williamsburgh	1,000,000	50	131	—
" Bonds	1,000,000	—	—	111

Situation Wanted
AS SUPERINTENDENT OF GAS WORKS.

Can come well recommended as to character and ability. Address "GAS SUPERINTENDENT," 653-6 Care this Journal.

WANTED,
A Position as Superintendent of a Gas Works,

By a man of 20 years' experience. Sets his own retorts; understands gasfitting and laying of mains. The bookkeeping will also be taken if desired. Best of references. Address 653-1 "R. R.," care this Journal.

FOR SALE,

One Multitubular Condenser and By-Pass.

One Washer and By-Pass.

Hydraulic Mains and Bench Castings for Two Benches of Fives.

The above made for 8-inch connections.

Also, Five Eight-Inch Valves.

THE DERBY GAS COMPANY, Birmingham, Conn.

Superintendent's Position Desired

By a practical man of twenty-five years' experience in the manufacture and distribution of coal and water gas. Satisfactory references given. Address 646-tf "ENGINEER," care this Office.

To Gas Companies, Engineers, and Municipal Bodies.

WANTED, AN ENGAGEMENT AS ENGINEER OR MANAGER OF GAS OR WATER WORKS. Twenty-five years' experience in England, Ireland, S. America, and the West Indies. Speaks Spanish. A thorough practical knowledge of mechanical engineering; a good draughtsman. First-class testimonials and references. Disengaged in December. Address 652-2 "CONSTANTINE," 235 Tenth Av., N. Y. City.

FOR SALE—A BARGAIN.

One Set of Four Purifiers, with cast iron boxes. Size of boxes, 10x12 ft., with 12 in. connections and dry center seal. Also, **Four Cylinder Condensers** and **One Washer. One 10 H.P. Engine,** and **One 40 H.P. Boiler. Shafting, Pulleys, etc.** For particulars, address 652-4 MUNICIPAL GAS CO., Albany, N. Y.

SITUATION WANTED
As Superintendent of Gas Works.

Has filled the position of engineer and superintendent of gas works for eight years. Understands the manufacture and distribution of gas, laying mains and services, the fixture and fitting business, and keeping accounts. Good references given.

Or would prefer to lease a works in a good city or town of 6,000 or 10,000 inhabitants, and would endeavor to advance th interests of the stockholders.

Address GEO. M. McCONAUGHEY, Care Austin Gas Lt. and Coal Co., Austin, Texas.

GAS vs. ELECTRIC LIGHT.

We would invite attention to the able and exhaustive argument of General A. Hickenlooper, President of the Cincinnati Gas Light and Coke Company, contained in a handsome pamphlet of 96 pages, entitled

"Edison's Incandescent Electric Lights for Street Illumination. Report of an Argument Delivered by A. Hickenlooper before the Committee on Light, Municipal Council, City of Cincinnati, July 22, 1886."

This is a subject of special interest to all Gas Light Companies.

Prices.

50 copies	$12.50	250 copies	$50.00
100 copies	22.50	500 copies	87.50

A sample copy will be sent by mail on receipt of 50 cts.

A. M. CALLENDER, & CO., 42 Pine St., N. Y. City

GEROULD'S IMPROVED RETORT CEMENT.

A Cement for patching retorts, putting on mouthpieces, and making up all bench-work joints. This Cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick. For recommendations and price list address

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HOWARD FLEMING,
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IMPORTER of
"BRIDGEND" "DINAS"
Silica FIRE Bricks
FOR COKE OVENS AND GAS WORKS.
PORTLAND AND ROMAN CEMENTS.
Correspondence Invited. Lowest Prices.

Notice to Gas Companies.

We desire to inform you that letters patent of the United States No. 345,368, applied for on November 21, 1885, were issued to us on July 13, 1886, for an improvement in Automatic Gas Governors, which improvement is set forth in the claim of said patent as follows, viz.:

"The combination of an automatic gas governor so constructed as to automatically increase or diminish the pressure at its outlet in proportion to the volume of gas passing through it, and an adjustable valve so constructed and arranged as to be capable of adjustment to pass different volumes of gas without changing the length of stroke or travel, substantially as and for the purpose specified."

We desire to notify you that we consider that any automatic gas governor having such an adjustable valve is covered by the said patent, and that all automatic governors containing such valves not made by us are infringements of our said patent. We give this notice that all persons may be informed of our claim, so that no one may ignorantly infringe upon our rights.

Very respectfully,
T. E. & J. S. CONNELLY,
Of CONNELLY & CO., LIMITED.

GAS COMPANIES, ATTENTION!

Increase the demand for Coke by using the

Star Coke Breaker.

Simple, Cheap, Durable. Easily Sharpened by any Blacksmith.

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AUTOMATIC RAILWAY, HOISTING ELEVATOR, CABLE RAILWAY, STEAM SHOVEL, HOISTING ENGINES, COAL TUBS, COAL & COKE CARS.
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Send for a Descriptive Pamphlet.

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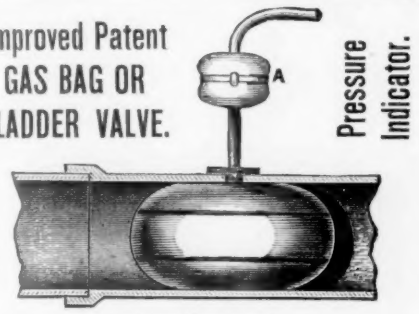
Special Designs furnished for Gas Fixtures for Churches, Public Halls, Lodges, etc.

Improved Patent GAS BAG OR BLADDER VALVE.



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PEERLESS MFG. CO., 34 Murray St., N.Y.

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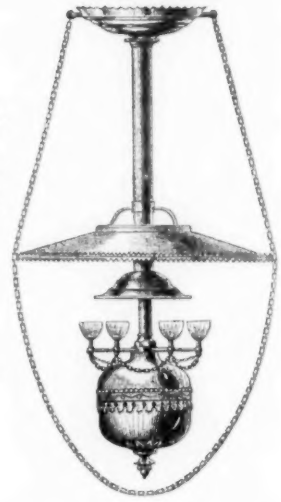
THE CRYSTAL CARBON LIGHT!

SELF-LIGHTING! SELF-REGULATING!

The Latest and Most Improved Carbon Light!



This Gas Burner, which is in reality an enriching gas machine, increases the illuminating power of ordinary coal or water gas to a point where it is comparable only to the dazzling brilliancy of the electric arc. Our new "Carboncrystal" (see below) has been prepared specially for this light, and is better adapted to it and purer than anything ever before used for this purpose. Under our newly introduced system of filling vessels *no attention whatever* is required to our lights on the part of the consumer. The actual efficiency of our new burner is between 8 and 9 candle power per cubic foot. This efficiency is constant in our smallest and largest clusters. We are aware that several manufacturers advertise as much as 13 candle power per foot. We make no such misleading statements as these, but still claim the highest possible efficiency, and declare, without fear of intelligent contradiction, that our system of lighting is more generally practical than any other improved system.

CARBONCRYSTAL.

(Trade Mark.)

A new and superior preparation for enriching gas used in conjunction with Crystal Carbon or Albo-Carbon gas lights. The preparation is cleaner and better adapted for filling burner vessels than any hitherto produced. Guaranteed to be chemically pure. Supplied in cans from 10 pounds up.

CRYSTAL CARBON LIGHT CO.,

Main Office, 1018 Chestnut Street, Philadelphia, Pa.

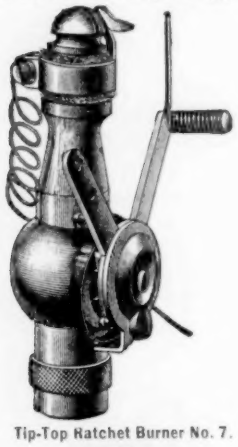
AGENCIES: Philadelphia, Pa. Kansas City, Mo. Reading, Pa. Providence, R. I. Baltimore, Md. Memphis, Tenn. Cedar Rapids, Iowa. Omaha, Neb. Minneapolis, Minn. San Francisco, Cal. St. Louis, Mo.

THE ELECTRIC GAS-LIGHTING CO., No. 45 Milk St., Boston, Mass.

Patentees, Manufacturers and Wholesale Dealers in Electric Gas-Lighting Apparatus and Various Electrical Appliances, refers with pride to its

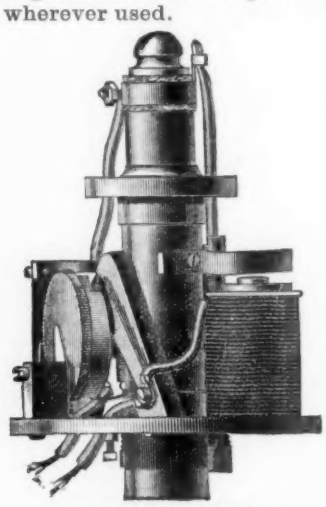
NEW "SINGLE MAGNET" RATCHET AUTOMATIC,

For House Lighting, which is conceded to be the Most Practical-Working Automatic Gas Lighter and Extinguisher yet produced. It gives great satisfaction wherever used.

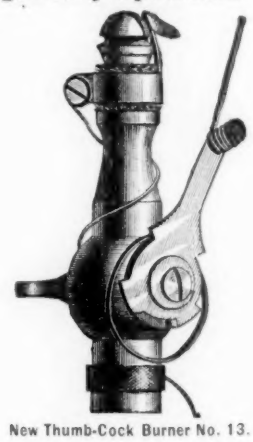


Tip-Top Ratchet Burner No. 7.

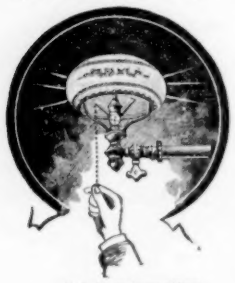
"Single Magnet" Ratchet Automatic No. 4. For Houses, Banks, Stores, Offices, Workshops, and Factories.



New Ratchet Automatic No. 4. The Ideal Burner without its Shell.



New Thumb-Cock Burner No. 13.



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MOTTO: SUPERIOR GOODS AT LOW PRICES.—Our Automatic and Pendant Gas-Lighting Apparatus and Electrical Supplies are used by first-class dealers throughout this country, and to a considerable extent in Europe.

Dealers will find it profitable to handle the improved, standard goods manufactured by this Company under its increased facilities. Our prices will be found low for first-class goods.

SUGGESTIVE.—The convenience and luxury of gas light is largely augmented by the use of Our Electric Gas Lighting Apparatus. Gas Companies everywhere will find it advantageous to favor its more extensive introduction and use.

For Descriptive Circulars, Price Lists, etc., please address, inclosing business card,

THE ELECTRIC GAS-LIGHTING CO.,

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THE BOWER GAS LAMP.

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THE CLERK GAS ENGINE CO.,

Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec. S. LEWIS JONES, Asst. Sec. A. J. DOTY, Supt.

The utility and convenience of the Gas Engine being no longer an open question, it only remains now for intending purchasers to select the BEST. We claim for the CLERK GAS ENGINE that it is equal to any other manufactured as regards steadiness in running, simplicity, and ease of keeping in repair, and that it gives the greatest amount of power for the least money (both in first cost and expense of running) of any engine made. In support of this claim we refer to the test of the Gas Engines made under the direction of the American Institute of New York, in December, 1885, and heretofore published in these columns. These engines are especially adapted for continuous running under heavy loads, and we can refer to Engines which have run 22 hours a day for months at a time.

Made in Sizes of 5, 10, 15, 20, and 25 Horse Power. All Engines Guaranteed for One Year.

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AS A SOURCE OF

LIGHT, HEAT, AND POWER.

By C. J. R. HUMPHREYS.

A Pamphlet of twenty-nine pages, treating of the use of Gas as a source of Light, Heat, and Power.

DESIGNED FOR DISTRIBUTION BY GAS COMPANIES AMONG THEIR CUSTOMERS AND OTHERS.

Price, 10 cents each, $5 per 100, $50 per 1,000.

Gas Companies can have their own imprint placed on cover without extra charge. All orders to be sent to

A. M. CALLENDER & CO.,

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Price, ... $10.00.

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A. M. CALLENDER & CO., No. 42 Pine Street, N. Y. City.

To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,

248 N. 8th Street, Phila., Pa.

Pat. Sept., 1885. Just the thing for street lamps. No moving parts; only the gas moves, and checks itself by opposing currents; cannot get out of order or wear out; the cheapest and best of all governors. Samples, by mail, 10 cents. Send for circular.

ADAM WEBER'S

New and Improved Regenerative Furnace.

ESPECIALLY ADAPTED FOR USE IN SMALL GAS WORKS.

A Saving of at Least Forty per Cent. over Old Methods.

Cheapness of construction and absence of elaboration are the chief characteristics of this Furnace. It is also applicable in cases where it is not convenient to excavate deeply below the line of the retort house.

Correspondence respectfully solicited. Descriptive Circulars on application.

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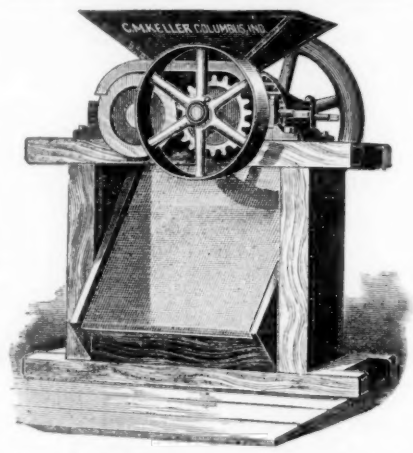

Keller's Adjustable Coke Crusher.

SIMPLE, STRONG, AND DURABLE.

C. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

Correspondence Solicited.

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NAPTHA AND GASOLINES.

ALSO MANUFACTURERS OF

A Special Grade of Naptha for Gas Companies

FOR ENRICHINC COAL CAS.

Correspondence solicited.

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GAS WORKS

UNDER THE

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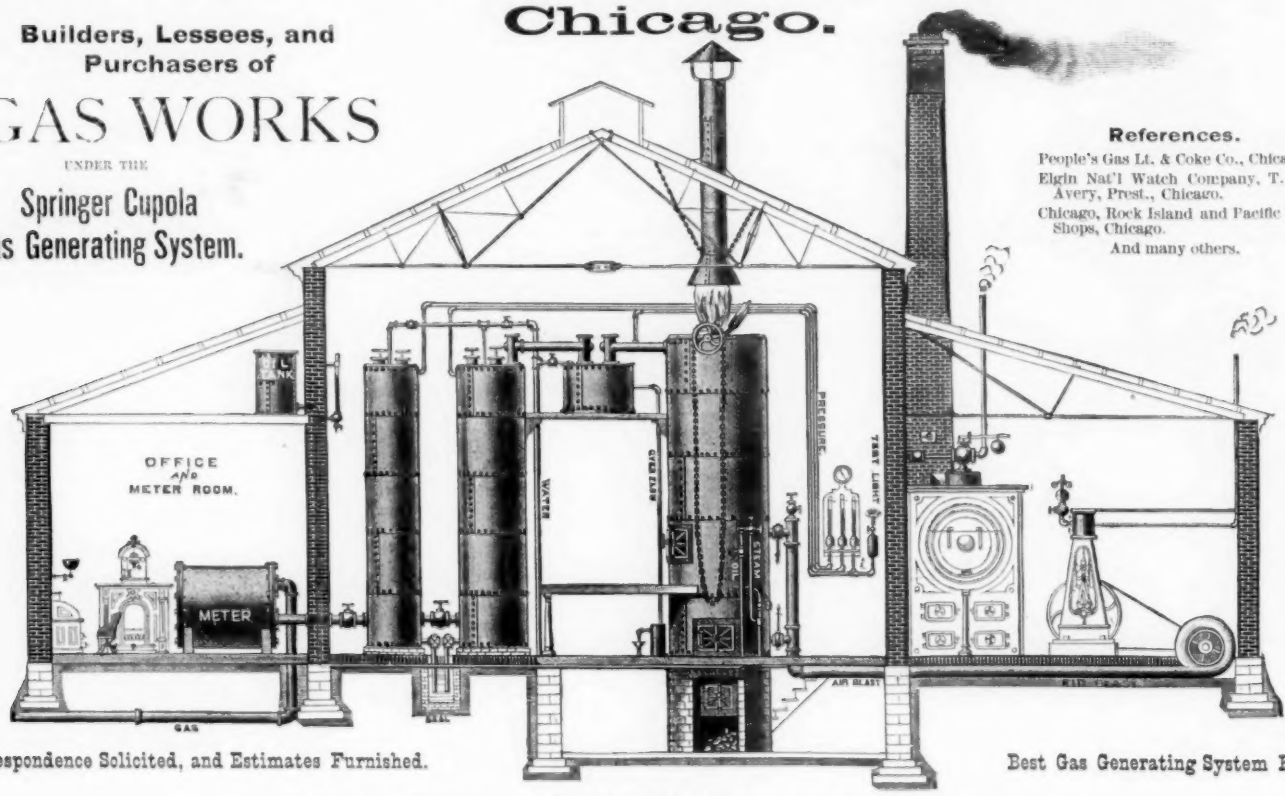

References.

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Elgin Nat'l Watch Company, T. M. Avery, Prest., Chicago.
Chicago, Rock Island and Pacific Ry. Shops, Chicago.
And many others.

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Best Gas Generating System Known.

Orders from Cities, Towns, and Public Institutions Promptly Executed. Address

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CONNELLY'S

AUTOMATIC GOVERNOR FOR STREET MAINS.

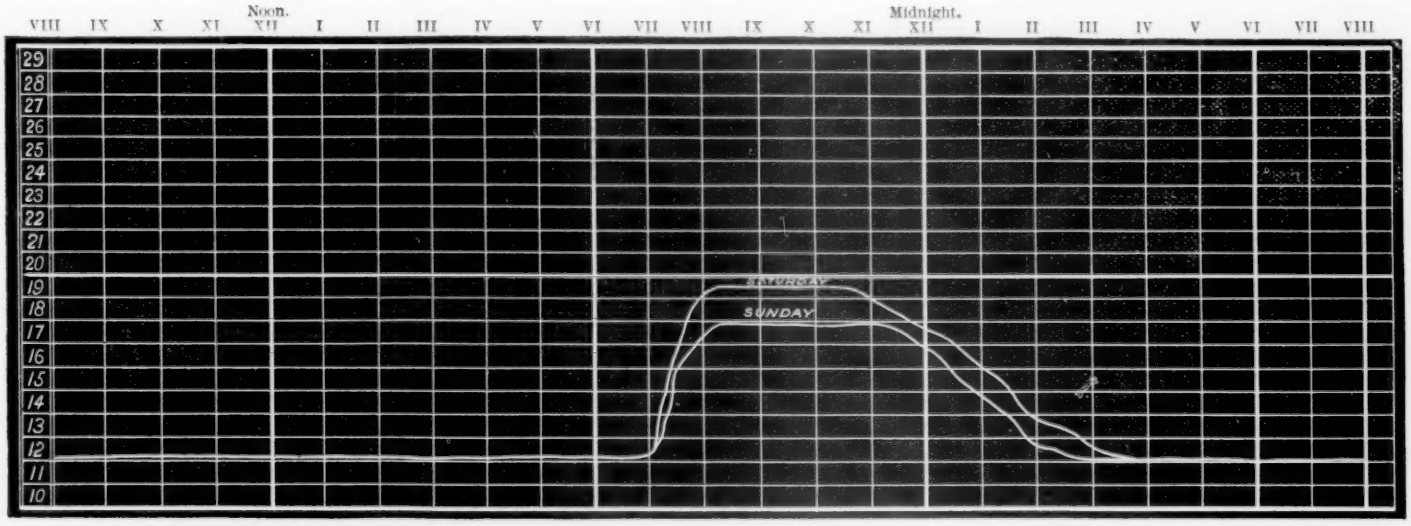
We invite the attention of all practical Gas Managers to the following letter and accompanying cut. The two lines show the pressure held by the Governor on Saturday and Sunday, and clearly illustrates the accuracy of the Governor in *increasing* and *reducing* pressure *in proportion to the volume of gas consumed.*

A Governor that puts the increased pressure on at "one fell swoop" and takes it off in like manner is *not* an "Automatic" Governor; and the circulation of pressure sheets showing such action by a so-called "Automatic" Governor is a rather amusing reflection on the intelligence of Gas Managers.

Strictly speaking, a "Balanced" Governor is an "Automatic" one, as it automatically varies the volume of gas sent out to *maintain a uniform pressure* at its outlet. But, as now applied, the term "Automatic Governor" is understood to mean a Governor that will *maintain pressure between any two desired extremes, in direct proportion to the volume of gas consumed.* Therefore pressure sheets showing *instantaneous changes* from maximum to minimum and *vice versa*, circulated broadcast as the record of an "Automatic (?) Governor," reveals inexcusable ignorance of the subject, amusing to many, yet liable to mislead the inexperienced novice.

We would suggest that all Gas Companies contemplating the placing of *Automatic* Governors would consult their own interests and avoid annoying experience by adopting a Governor *that has a record.*

CONNELLY & CO., LTD., 177 Broadway, N. Y.


VIII IX X XI Noon. XII I II III IV V VI VII VIII IX X XI Midnight. XII I II III IV V VI VII VIII
29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10
SATURDAY
SUNDAY

Card Showing Pressure at the Milwaukee Gas Works, Saturday, July 10, and Sunday, July 11, 1886.

MILWAUKEE, WIS., August 3d, 1886.

MESSRS. CONNELLY & CO., LTD., 177 Broadway, New York:

Gentlemen—Replying to yours of 29th, I send you a little package of register sheets. When your Governor (20-inch) was set I adjusted it to give 13-tenths day pressure and 22-tenths night pressure. Saturday nights it would run up to 25-tenths. Whenever it would cloud up in the daytime it would go up at first indication of darkness to about 15-tenths. I hunted back in the sheets to find one when pressure was increased in the daytime, but it is so long since we have had a stormy day I could not find one. You can, however, see a *slight change* on sheets for June 1 and June 25. You will see, too, that lately the Governor only puts on *about* 20-*tenths maximum pressure.* This is because *less gas is burned than when it was adjusted.* We have no complaints of pressure, and everyone appears satisfied. In conclusion, can say the Governor has *never been touched* since it was first adjusted, and has at all times *done just the work we wished it to do.* Very truly yours, E. G. COWDERY, Engr. & Supt.

THE ALBO-CARBON LIGHT!

A new system of Carburetting heated Gas by means of a solid material, whereby its illuminating power is increased more than three-fold.

SUPERIOR TO ALL OTHER SYSTEMS FOR

Economy, Safety, Illuminating Power and General Practicability,

The Albo-Carbon process enables Gas Companies to supply a light equal to the Arc Light, at a much less cost. Several Gas Companies are now using this system. The process is extensively used in Europe, and is being rapidly adopted in this country.

The public are cautioned against purchasing or using apparatus which infringe our patent rights. Legal proceedings are now pending in the United States Courts against parties for infringing the same by the manufacture and sale of such apparatus. We purpose proceeding against all persons infringing the said patents.

THE ALBO-CARBON LIGHT COMPANY, - - - - - NEWARK, N. J.,

Sole Manufacturers for the United States.

T. C. HOPPER'S

AUTOMATIC DIFFERENTIAL GAS GOVERNOR

Is now in Practical Operation, doing Perfect Automatic Service with Great Precision.

Others (6, 8, 12 and 16 inch) are now being set; and many more to be shipped soon.

BE SURE TO THOROUCHLY INVESTIGATE THE SUPERIOR MERITS OF THIS COVERNOR BEFORE PURCHASING.

For Simplicity and Reliable Work it has no Equal. Correspondence Solicited.

Arch and 22d Streets, Phila., Pa.

MUNICH REGENERATIVE FURNACE

System Drs. Schilling and Bunte.

Greatest Durability! Minimum of Attention!

COMPLETE DISTILLATION IN 3½ HOURS.

Ten to Thirteen Pounds of Coke to Hundredweight of Coal.

NO CLINKER. NO CARBONIC OXIDE IN THE REGENERATIVE FLUES.

Almost Automatic in Action.

The Most Successful Regenerative Furnace in Use.

BARTLETT, HAYWARD & CO

Agents for the United States.

The Champion Gas Generators.

Patented December 25th, 1883, No. 290,926; April 6th, 1886, No. 339,471; April 6th, 1886, No. 339,472; May 6th, 1886, No. 341,506. Other Patents Pending.

These Generators are designed to manufacture Siemens Gas (30% combustible), Water Gas (carbonic oxide and hydrogen, non-illuminating), or Carburetted Hydrogen (illuminating gas of any candle power desired),

From Any Combustible Material, More than Twice as Fast, and at Less than Half the Cost,

As compared with the best regenerative coal bench or water gas apparatus in the market. Drawings and specifications can be obtained from the Commissioner of Patents, Washington, D. C., and are also in the hands of the principal builders of gas works in Richmond, Philadelphia, Baltimore, New York, Brooklyn, Waltham, Cincinnati, Fort Wayne, and Chicago, from whom estimates can be obtained of cost of any size o Generators required. **$2,000 Reward** to any gas experts or inventors (for their own benefit) who can design superior processes and apparatus without infringing upon the United States patents above mentioned. For terms of use apply to

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Inventor, Patentee, and Sole Owner,

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Steam-Jet Exhausters

Requires one-half the flo r space and one-third less steam than any other Exhauster in the market. More cheaply and easily connected, as outside by-pass valves are dispensed with. It is the only Exhauster manufactured having Compensator and Governor combined; the Compensator with all other Exhausters being a separate and distinct machine. It is simple in construction, easily adjusted, not liable to get out of order, and can be operated by ordinary workmen. Over **1,000 now in use.**

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Hydraulic Main Dip Regulators, also Check Valves, Foot Valves, Yard-wash and Fire Hydrants.

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Valves.—Double and Single Gate, ½ in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, and Oil.

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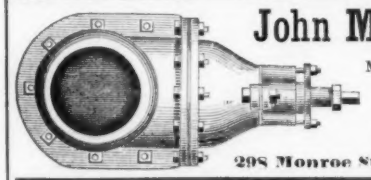

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Man'facturer of

GAS VALVES.

298 Monroe Street, N. Y.

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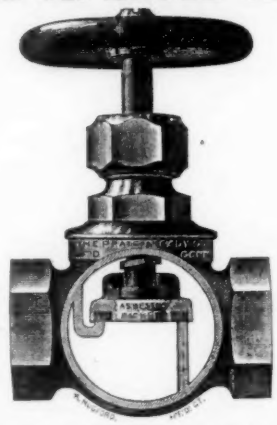
RENEWABLE DISC

GLOBE OR ANGLE VALVE.

Best Gas Valve in the Market.



COCKS THAT NEVER STICK.

Also Straightway Stop and Check Valves with Asbestos Disc and **Asbestos Packed Cocks,** which will keep tight where all other valves fail. We invite inspection and trial by all interested in this line of goods. All goods are warranted to give satisfaction. ☞ Send for Circular and Price List.

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In all Sizes, for Domestic, Restaurant, and Hotel Use.

Also,

A Variety of Apparatus for Mechanical Purposes, Using Gas as Fuel.

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Gas House Tiles,
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Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays, etc.
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CLAY GAS RETORTS
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Clay Gas Retorts, Fire Brick, and Fire Clay Goods of Every Description.
Plans of Livesey-Somerville, McIlhenny, and other Furnaces, and Competent Workmen Supplied.

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We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. Our customers are in almost every State of the Union, to all of whom we refer.

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Red and Buff Ornamental Tiles and Chimney Tops. Drain and Sewer Pipe (from 2 to 30 inches). Baker Oven Tiles 12x12x2 and 10x10x2.
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Sewer Pipe, 3 to 24 in. diameter.

Glass Pot Clay, Ground Fire Clay, in barrels and in bulk. All kinds of Fire Clay Goods.

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Blast Furnace Linings, Cupola Blocks, Boiler Tiles, Grate Settings, and Stove Linings. Fire Cement, Fire Clay, Fire Sand, and all other Fire Clay Goods.

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The attention of all Gas Engineers is called to our Fire-Proof Material, viz.:

CLAY GAS RETORTS

(ENAMELED AND UNENAMELLED),

Blocks, Tiles

AND

EXTRA FIRE BRICK,

Pronounced by the highest authorities as superior to and excelling any other similar manufacture. The component of aluminum contained in our material (up to 45 per cent.) is larger than in any other material heretofore sold in the United States; whilst the uniformity of the goods is assured by the most scrupulous analysis of the clay used.

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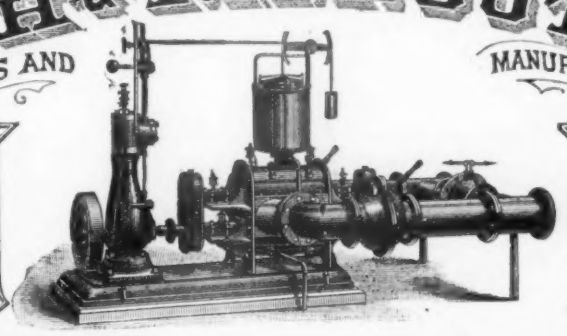

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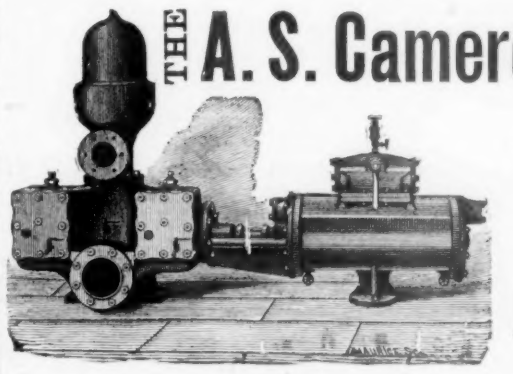

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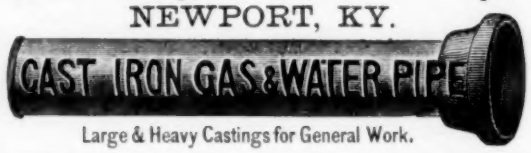

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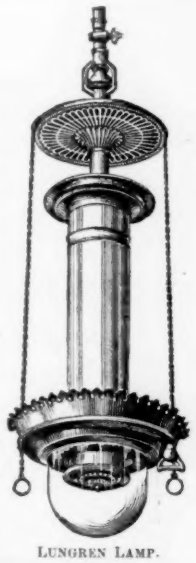

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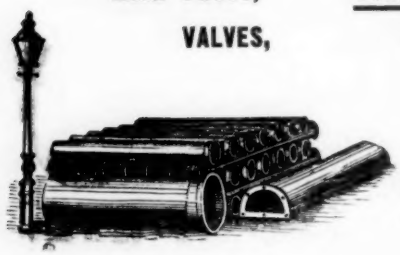

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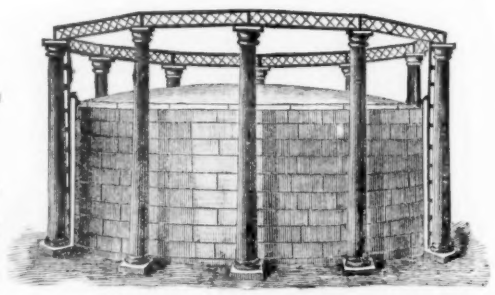

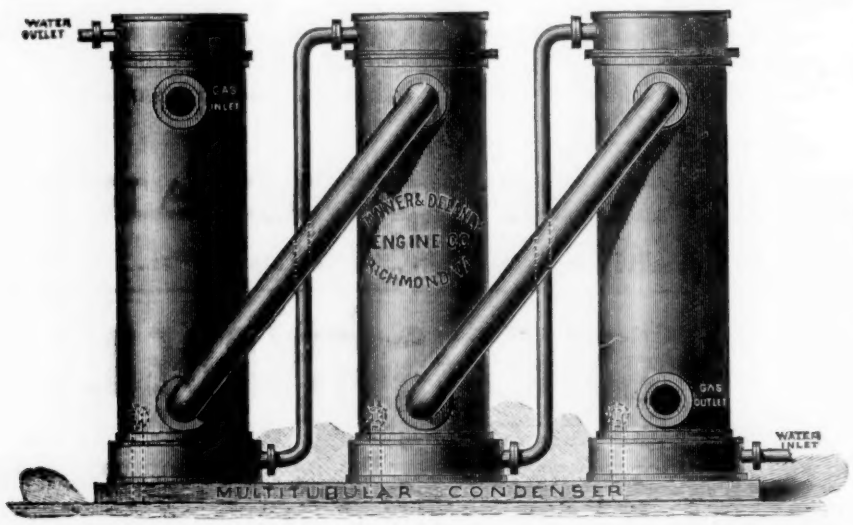

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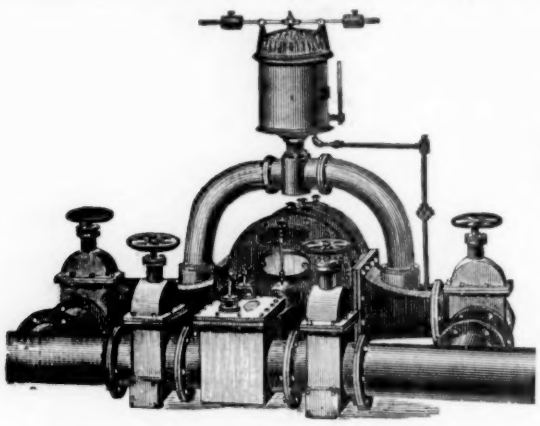

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" "	"	220,000	"
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Canton, "	"	60,000	"
Akron, "	"	80,000	"
Xenia, "	"	10,000	"
Adrian, Mich	"	65,000	"
Ypsilanti, Mich	"	25,000	"
Muskegon, "	"	70,000	"
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Anderson, "	"	20,000	"
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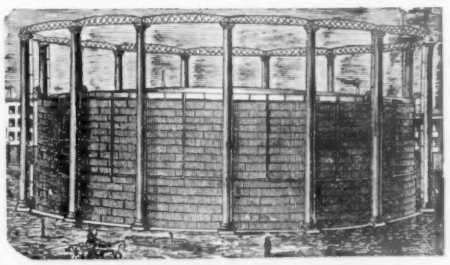

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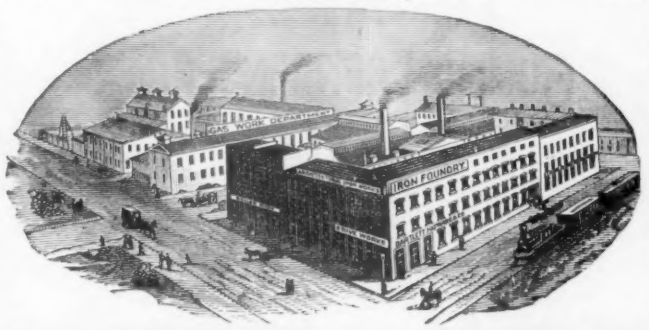

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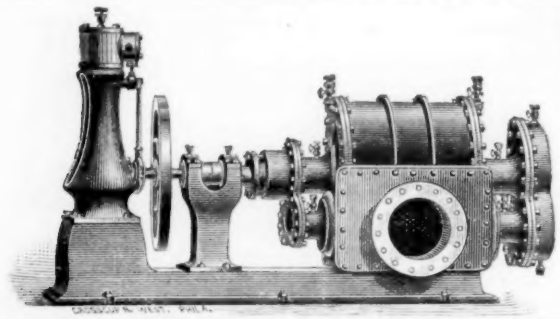

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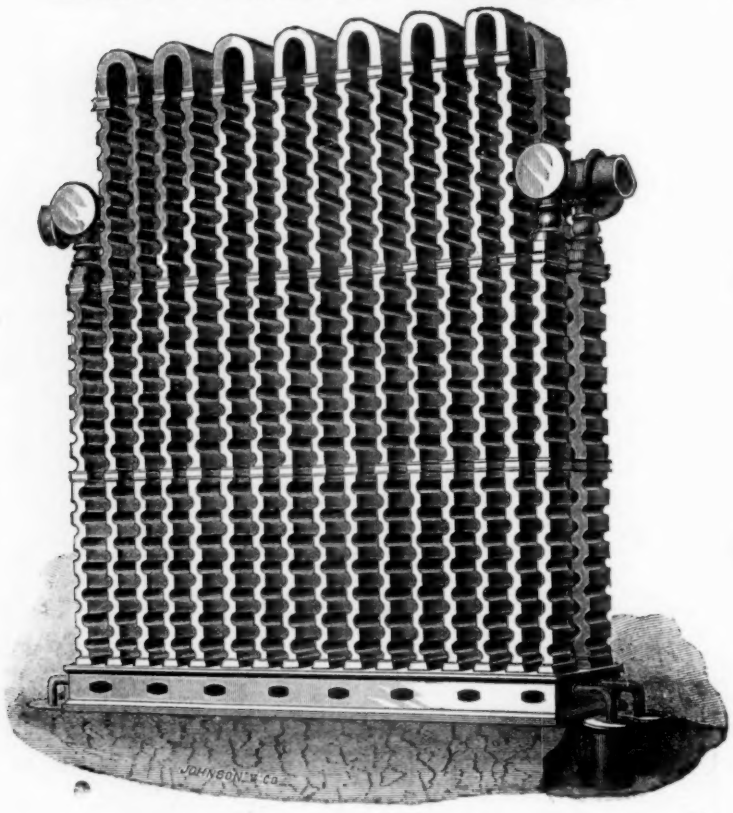

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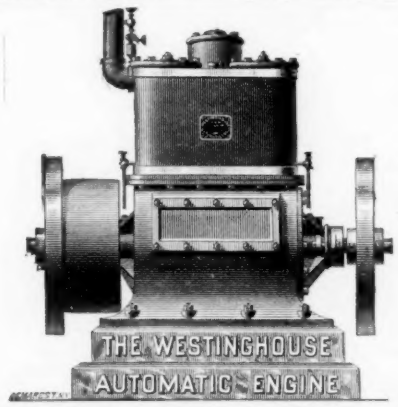

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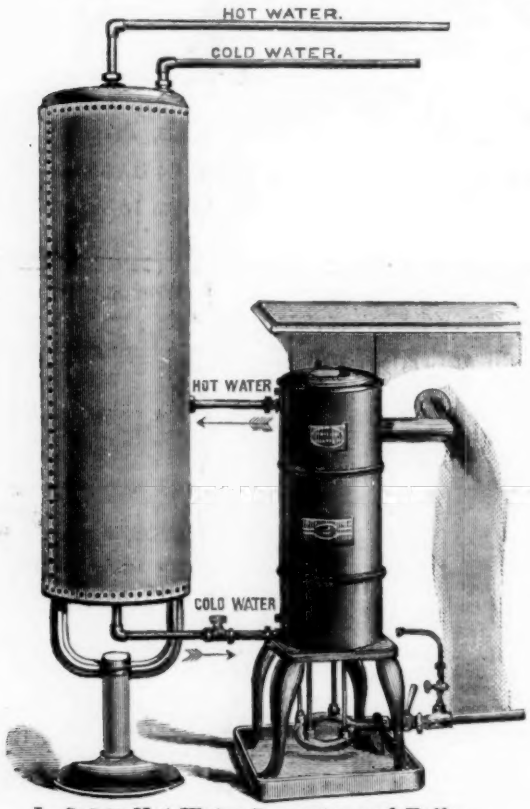

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